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Russia's Path(s) to War

A bell¿ngcat Investigation

Not Russia

Russia

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Summary

The extent of Russia's role in the ongoing conflict in Eastern Ukraine has yet to be determined. Thus far, Russia denies any direct involvement in the war. However, most Western nations do not share Russia's position and assume that Russia is directly or at least indirectly involved. This same ambiguity, which continues to affect the conflict in Eastern Ukraine to this day, also characterized the annexation of Crimea last year. At first, Russia denied any direct involvement in the military operations that blocked Ukraine's armed forces and led to the seizure of key buildings and other locations on the peninsula. Later, however, Moscow acknowledged the active role played by Russian servicemen. (It should be noted that photographic and video evidence had already clearly depicted the involvement of Russia's armed forces in March 2014.)

The current state of the conflict in Eastern Ukraine is similar to the situation in Crimea in March 2014. Russia claims that its forces are not involved despite a plethora of evidence to the contrary. Reports have been published analyzing the presence of Russian equipment in Ukraine, documenting cross-border artillery attacks, and demonstrating the participation of active Russian servicemen in the conflict. This report examines one aspect of the Russian-Ukrainian war, namely, the alleged cross-border traffic of Russian forces into Eastern Ukraine. If it is possible to link cross-border traffic to Russia's armed forces, this not only provides additional evidence for Russia's involvement, it also allows for a better assessment of the extent of Russia's involvement. This report, which primarily focuses on events in the summer of 2014, is solely based upon open source information; the identification and verification of border crossings was performed relying on publicly available satellite imagery.

Using satellite imagery, this report's assessment of the border area in the conflict zone shows that there are at least 60 tracks crossing the border. Four to five border crossings are of a scale not seen along the border before, and roughly two dozen are assessed as being closely related to the Russian army. Two different types of border crossings were identified: tracks crossing the border to launch attacks from inside Ukraine and tracks crossing the border to enter Ukraine and reach – in most cases – an unknown target inside Ukraine. New tracks were documented for July, August, and September 2014, the months that saw the most intense fighting along the border last summer. The key findings and results of this report include:

- A description of approximately 30 of the visible border crossings and the close relationship – both in place and time – between all major border crossings and major battles in the border area of Eastern Ukraine.
- New visual evidence documenting the border crossings, including military vehicles and equipment stationed along the border and large groups of military hardware traveling on paths clearly related to border crossings
- An assessment establishing or strengthening (as the case may be) the links between the border crossings and Russia's armed forces through the documentation of Russian bases via satellite imagery and/or photographs uploaded to social media by Russian soldiers

The evidence presented below confirms that Russia's armed forces participated in the war throughout the entire summer of 2014. Moreover, it is further shown that this participation by Russia decisively changed the course of the war.

Keywords: Russian-Ukrainian war, border crossings, Russia's Armed Forces inside Ukraine, Defeat of Ukrainian forces

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Introduction

The extent of Russia's role in the ongoing conflict in Eastern Ukraine is still to be determined. So far, Russia denies any direct involvement in the war.[1] However, most Western nations do not share Russia's position and assume that Russia is directly or at least indirectly involved.[2] Nevertheless, the wording used to describe the conflict and the forces opposing Ukraine in Eastern Ukraine, in particular, remains ambiguous. Since the beginning of the conflict, the main terminology employed has been either "pro-Russian separatists" or "Russian-backed separatists." While both terms include the term "Russia," only the latter implies Russian involvement. Only recently have more direct formulations come into use, such as "combined Russian-separatist forces." However, the precise degree of Russia's involvement cannot be deduced from any of these terms.

The same ambiguity still affecting the conflict in Eastern Ukraine today also characterized the annexation of Crimea last year.[3] At first, Russia denied any direct involvement in the military operations that blocked Ukraine's armed forces and led to the seizure of key buildings and other locations on the peninsula. Later, however, Moscow acknowledged the active role played by Russian servicemen.[4] (It should be noted that photographic and video evidence had already clearly depicted the involvement of Russia's armed forces in March 2014.)[5]

The current state of the conflict in Eastern Ukraine is similar to the situation in Crimea in March 2014. Russia claims that its forces are not involved despite a plethora of evidence to the contrary. For instance, numerous reports have been published documenting the presence of Russian equipment in Ukraine that is either unique to Russia or had been seen in Russia before appearing again in Ukraine.[6] In addition, freely available satellite imagery allowed for

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1   cf.: http://www.themoscowtimes.com/news/article/lavrov-no-russian-intervention-in-ukraine/506231.html, http://www.reuters.com/article/2015/01/21/ukraine-crisis-lavrov-idUSL6N0V01PC20150121, http://www.reuters.com/video/2015/04/16/putin-repeats-denial-of-russian-involvem?videoId=363878608 and http://government.ru/en/news/19011/ (last accessed on 25 July 2015)

2   cf..: http://www.euronews.com/2015/02/25/kerry-accuses-russia-of-lying-over-ukraine-involvement/, http://www.spiegel.de/politik/deutschland/angela-merkel-scharfe-kritik-an-russland-in-der-ukraine-krise-a-1005054.html, http://www.reuters.com/article/2015/06/01/us-ukraine-crisis-un-idUSKBN0OH2SK20150601 and http://www.pbs.org/newshour/rundown/u-s-condemns-russias-invasion-ukraine/ (last accessed on 25 July 2015)

3   Note: Russia does not consider the events surrounding Crimea to be an annexation; however, the majority of the members of the UN voted in favor of a resolution that affirmed Ukraine's territorial integrity and opposed the Crimean referendum, cf.: http://www.bbc.com/news/world-europe-26776416 (last accessed on 25 July 2015)

4   In a journalist session on 4 March 2014, Vladimir Putin stated that the troops blocking the Ukrainian army were local self-defense units. On 17 November 2014, he stated in a German TV interview that Russian ("our") armed forces blocked the Ukrainian military, cf.: http://en.kremlin.ru/events/president/news/20366 and http://www.ndr.de/nachrichten/Putin-und-der-russische-Standpunkt,putininterview108.html (last accessed on 25 July 2015)

5   A Russian GAZ Tigr – a vehicle unique to the Russian Armed Forces – with Russian license plates is clearly visible beside unmarked soldiers in the video below, which documents the events that took place in the Belbek air base on 4 March 2014, https://www.youtube.com/watch?v=zncoOwGI-7Q (last accessed on 25 July 2015)

6   cf.: http://www.armamentresearch.com/ares-research-report-no-3-raising-red-flags-an-examination-of-arms-munitions-in-the-ongoing-conflict-in-ukraine-2014/ (last accessed on 3 August 2015) and http://www.atlanticcouncil.org/en/publications/reports/hiding-in-plain-sight-putin-s-war-in-ukraine-and-boris-nemtsov-s-putin-war, for individual vehicles (case studies): Buk M1: https://www.bellingcat.com/news/uk-and-europe/2014/11/08/origin-of-the-separatists-buk-a-bellingcat-investigation/ Msta-S: https://www.bellingcat.com/resources/case-studies/2015/05/29/confirming-the-location-of-the-same-msta-s-in-russia-and-ukraine/ BPM-97: https://www.bellingcat.com/news/uk-and-europe/2015/01/03/did-russia-send-a-new-batch-of-military-vehicles-to-separatists-controlled-ukraine/

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the analysis of artillery craters in Ukraine, linking them to launch areas in Russia and therefore proving that cross-border attacks had taken place,[7] a claim that is also supported by satellite imagery released by the United States (US).[8] Furthermore, there is evidence documenting the participation of active Russian servicemen in the conflict. Russian soldiers have been captured in Ukraine,[9] and there are reports covering the deaths of Russian soldiers in the war as well.[10] In addition to an interview with a Russian soldier who confirmed his active participation in the war,[11] there have been reports that used social media information to document the participation of Russian soldiers in the war in Eastern Ukraine.[12]

Russia considers all of this evidence to be inconclusive and denies that there are facts proving Russian involvement.[13] Russian officials have also stated that Russian servicemen who reportedly fought in Ukraine either crossed the border unintentionally or are fighting there as volunteers while on vacation.[14] These and other claims are difficult to abide given that Russian officials have repeatedly issued demonstrably false statements over the course of the conflict. For example, their early statements in March 2014 regarding the annexation of Crimea have since been contradicted by not only visual evidence, but also Russia's subsequent statements. The information provided in the 21 July 2014 Russian Ministry of Defense (MoD) press briefing following the downing of Malaysia Airlines flight 17 (MH17) has also been shown to be false.[15]

This report examines one aspect of the Russian-Ukrainian[16] war, namely, the alleged cross-border traffic of Russian forces into Eastern Ukraine. If it is possible to link cross-border traffic to Russia's armed forces, this not only provides additional evidence for Russia's involvement, it also allows a better assessment of the *extent* of Russia's engagement in the war. This report

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Pantsir S1: https://www.bellingcat.com/resources/case-studies/2015/05/28/russias-pantsir-s1s-geolocated-in-ukraine/
Forpost drone: https://www.bellingcat.com/news/uk-and-europe/2015/06/13/the-russian-forpost-drone-shot-down-in-ukraine/ (last accessed on 25 July 2015)
Note: even the follow-up memorandum of Minsk 1 included exclusively Russian military equipment (e.g. RS 30 Tornado-G), cf.: http://www.4freerussia.org/putin.war/ and http://www.osce.org/ru/home/123807?download=true (last accessed on 25 July 2015)

7   cf.: https://www.bellingcat.com/news/uk-and-europe/2015/02/17/origin-of-artillery-attacks/ (last accessed on 25 July 2015)
8   e.g. https://twitter.com/GeoffPyatt/status/493390505003069440 (last accessed on 25 July 2015)
9   cf.: http://www.telegraph.co.uk/news/worldnews/europe/ukraine/11056727/Russian-soldiers-capture-in-Ukraine-threatens-to-cloud-Putin-Poroshenko-talks.html, http://www.nytimes.com/2015/05/22/world/europe/ukraine-kiev-russian-soldiers-osce.html (last accessed on 25 July 2015)
     Note: Russia has only confirmed the active status of captured servicemen for the source revealed in 2014
10   cf.: http://www.atlanticcouncil.org/en/publications/reports/hiding-in-plain-sight-putin-s-war-in-ukraine-and-boris-nemtsov-s-putin-war, https://www.bellingcat.com/news/uk-and-europe/2015/05/22/three-graves/, http://www.4freerussia.org/putin.war/ (last accessed on 25 July 2015) and http://www.interpretermag.com/an-invasion-by-any-other-name-the-kremlins-dirty-war-in-ukraine/ (last accessed on 19 September 2015)
11   cf.: http://www.theguardian.com/world/2015/mar/25/russia-ukraine-soldier (last accessed on 25 July 2015)
12   cf.: https://news.vice.com/video/selfie-soldiers-russia-checks-in-to-ukraine and https://en.informnapalm.org/russian-invasion-into-ukraine-the-presentation-of-the-evidence-of-russia-s-participation-in-the-war-in-donbas/ (last accessed on 5 September 2015)
13   cf.: http://www.reuters.com/article/2015/01/21/ukraine-crisis-lavrov-idUSL6N0V01PC20150121 and http://sputniknews.com/politics/20150530/1022735234.html (last accessed on 25 July 2015)
14   cf.: http://www.msn.com/en-us/news/world/exclusive-mother-urges-russia-not-to-abandon-son-captured-in-ukraine/ar-AAc6SRL (last accessed on 25 July 2015)
15   cf.: https://www.bellingcat.com/news/uk-and-europe/2015/07/16/russias-colin-powell-moment-how-the-russian-governments-mh17-lies-were-exposed/ (last accessed on 25 July 2015)
16   Instead of using "pro-Russian separatists" or a similar moniker, the terms "Russia" and "Russian troops" are used in this report. This term includes official (i.e. regular) Russian Armed Forces, unofficial Russian Armed Forces (those mainly formed by Russians and supported or trained by Russia), and the locally recruited pro-Russian Armed Forces. This naming convention reflects the reality of Russia's deep involvement in the Russian-Ukrainian war and avoids the impression that the war in eastern Ukraine is solely an internal conflict.

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is solely based on open source information and primarily focuses on the events in the summer of 2014. For these months, the amount of information available allows a detailed examination of the conflict area. Because of the complete loss of Ukrainian control over the conflict zone's border area in summer 2014, analysis discussing later periods is much more complicated, as official border crossings could have been used, and the visual evidence on paved roads is quite limited in the available satellite imagery.

The period spanning July to September 2014 served as a turning point in the war and was characterized by intense fighting. Toward the end of July and in early August, the forces opposing Ukraine in the country's east seemed to be on the retreat, losing large swathes of territory that they had formerly controlled. Beginning in the middle of August, however, the situation changed, and by the end of August and early September, the Ukrainian army had lost major battles and, subsequently, control over large parts of Eastern Ukraine.

This report is organized into four sections. The first section provides a brief description of the situation in the time period considered and a description of the border area to be examined. The second section represents the core of the report, in which identified border crossings are presented in five defined regions. Along with satellite imagery of the area, additional information is used when available and sensible. The expectation is that information supplementary to satellite imagery will provide more accurate descriptions and attributions of the border crossings. In the third section, a brief assessment of the situation at the border is presented. The final section of the report concludes with a brief discussion of the results.

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The Russian-Ukrainian War and the Border Region

The exact moment that the conflict in Eastern Ukraine became a war is hard to define. It very much depends on the definition of war used and the assessment of the Crimean annexation. If the war in Eastern Ukraine is seen as continuation of a war[17] already precipitated in Crimea, the Russian-Ukrainian war began in February 2014. If the Crimean annexation and the war in Eastern Ukraine are considered separate events, the start of the war and the start of Russia's participation is harder to define. Plausible events and activities include the seizure of buildings in Eastern Ukraine, the beginning of Ukrainian military operations to regain control in these areas, the start of Russia's media campaign to create an atmosphere catalyzing an increasing number of Russian volunteers to fight in Eastern Ukraine, the provision of military equipment to anti-Ukraine forces, or the active involvement of the Russian armed forces. In any case, Russia became an active participant in the war no later than the date of the first Russian cross-border attack in the first half of July 2014.

The then ongoing war between Russia and Ukraine in Eastern Ukraine can be best described as a "limited" war. Both sides, especially Russia, did not use all available military means. However, since the first seizures of buildings in Ukraine, a continual deterioration of the situation could be discerned in the first half of 2014. The Russian forces' equipment improved nearly to the same degree that the Ukrainians were able to put pressure on them. At the start of July, both sides used tanks and had a large variety of military equipment at their disposal.[18]

Military Situation from July to September 2014

At the end of June 2014, some Ukrainian officials alleged that control over the border region had been regained, a claim that was immediately refuted by representatives of the self-proclaimed Donetsk People's Republic (DPR) and Luhansk People's Republic (LPR).[19] The need for better border control also became a major subject of Ukrainian politics, which in and of itself contradicted the claim that complete control had been achieved.[20] After the unilateral ceasefire at the end of June, Ukraine's armed forces began an offensive in the first half of July 2014, which led to regained control over Slavyansk, Kramatorsk, and other towns and villages in the northern part of the Donetsk region.

Toward the middle of July 2014, reports began surfacing of the first known cross-border attacks on Ukrainian armed forces deployed to control the Russian-Ukrainian border.[21] Fighting was especially intense near the strategically important Marynivka-Kuybyshevo border crossing, which served as the only support route for the Ukrainian troops positioned in the area. It is likely that the presence of the Buk M1 that was filmed in Snizhne on 17 July 2014, which is the main suspect in the downing of MH17, can be linked to this fighting.[22]

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17   Though there were no major hostilities in Crimea or an overt declaration of war by either party, Russia's unilateral annexation of the peninsula via military intervention is clearly an act of war as a violation of Ukraine's sovereignty and territorial integrity. Moreover, while full-fledged military conflict did not immediately break out, Russia undertook a number of aggressive military operations, including blocking Ukrainian forces, capturing Ukrainian vessels, and blockading a military harbor.

18   cf.: http://www.martenscentre.eu/publications/caught-act-proof-russian-military-intervention-ukraine and http://www.reuters.com/article/2014/06/12/us-ukraine-crisis-tanks-idUSKBN0EN1KS20140612 (last accessed on 31 July 2015)

19   cf.: http://tass.ru/en/world/737014 (last accessed on 26 July 2015)

20   cf.: http://www.nytimes.com/2014/06/30/world/europe/ukraine.html?_r=0 (last accessed on 26 July 2015)

21   cf.: https://www.bellingcat.com/news/uk-and-europe/2015/02/17/origin-of-artillery-attacks/ (last accessed on 25 July 2015)

22   cf.: https://www.youtube.com/watch?v=MVAOTWPmMM4&feature=youtu.be&t=4m16s (last accessed on 26 July 2015)

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The second half of July was characterized by an (unstable) local ceasefire near the crash site of MH17 and,[23] in the last week of July, a renewed Ukrainian offensive that led to regained control of large parts of the Donetsk and Luhansk regions. Though the Ukrainian offensive continued into August, control over the border area east of Marynivka was lost. The fighting intensified, and the situation worsened for the Ukrainian army over the course of the month. At the end of August and beginning of September, Ukraine's armed forces were defeated near Ilovais'k, the Luhansk airport, and east of Mariupol. Both Ukrainian and Western officials maintained that Russia's armed forces were actively participating in combat operations inside Ukraine during this period.[24] Almost all Ukrainian successes from July and the first half of August were negated, and the Russian forces gained and established control over large parts of Eastern Ukraine.
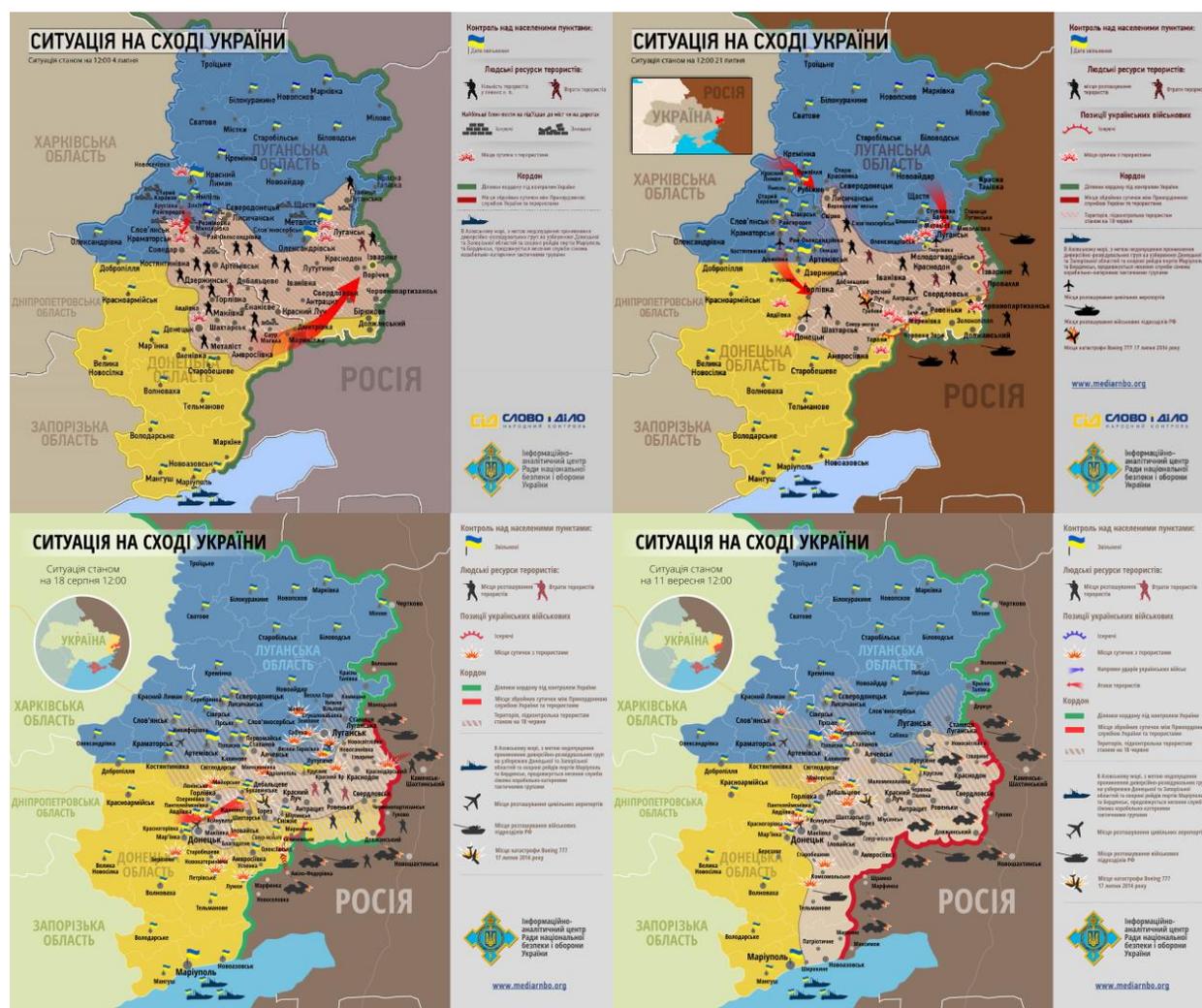
Figure 1: Situation maps by the NSDC; top left: 4 July 2014; top right: 21 July 2014; bottom left: 18 August 2014; bottom right: 11 September 2014; sources: http://euromaidanpress.com (4 July 2014), http://www.rnbo.gov.ua (all others)

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23   cf.: http://www.kyivpost.com/content/ukraine/poroshenko-orders-ceasefire-in-40-kilometers-radius-of-malaysian-boeing-crash-site-357109.html (last accessed on 8 August 2015)

24   cf.: http://www.rnbo.gov.ua/en/news/1796.html (last accessed on 26 July 2015)

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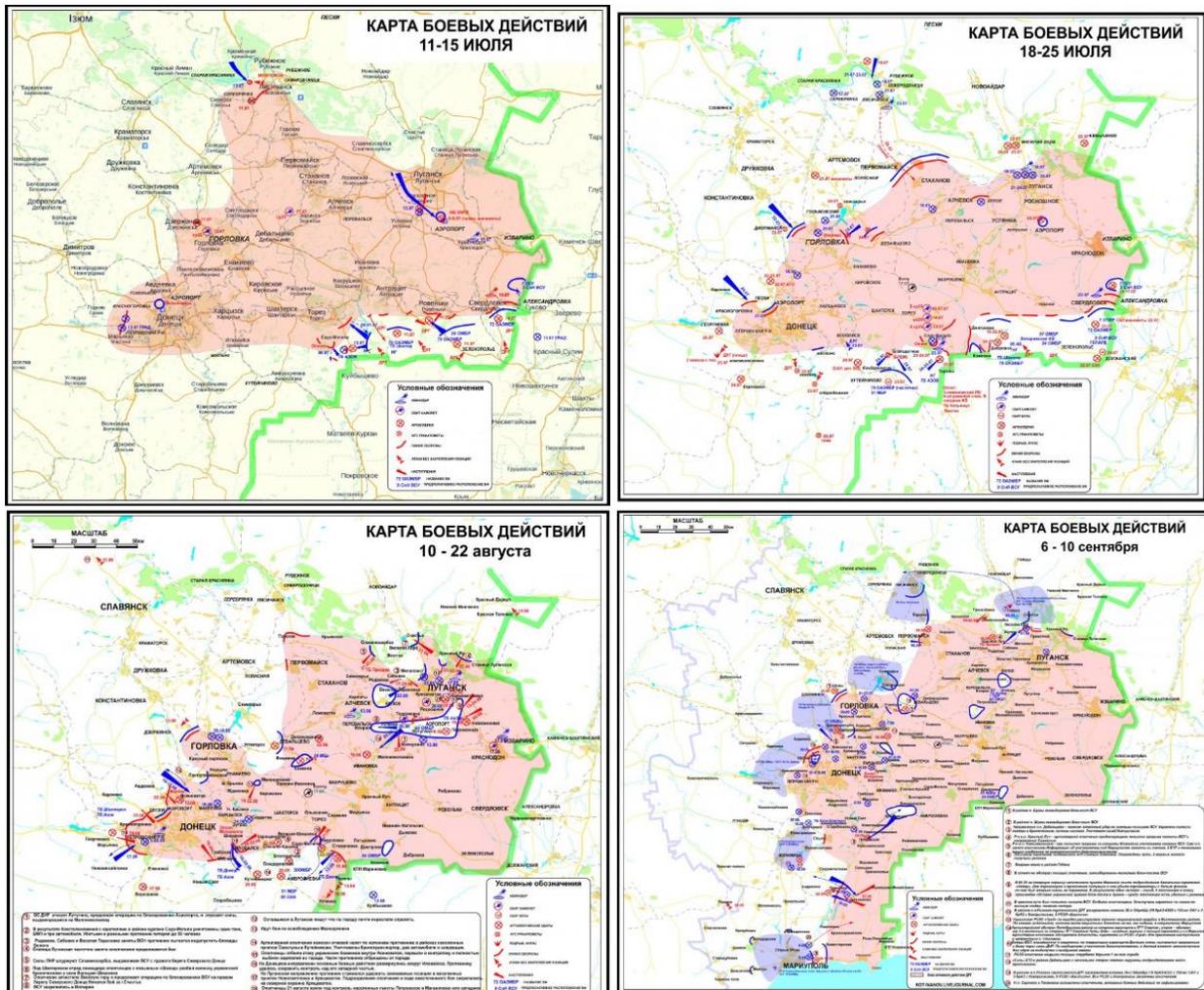
Figure 2: Situation maps by the Kot Ivanov blog; top left: 11-15 July 2014; top right: 18-25 July 2014; bottom left: 10-22 August 2014; bottom right: 6-10 September 2014; source: http://kot-ivanov.livejournal.com

Figure 1 present's four situation maps from the Ukrainian National Security and Defense Council (NSDC), and figure 2 presents four from the pro-Russian Kot Ivanov blog.[25, 26] The respective representations of the situation on the ground are not identical, but they do illustrate the developments discussed above. The Ukrainian gains between the end of July and the beginning of August are more pronounced in the NSDC maps.[27] It is also noteworthy that there is a video showing a Ukrainian convoy driving from Artemivsk to Saur Mogila, indicating that at least some degree of control was exercised by the Ukrainian army in the area.[28]

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25   cf.: http://kot-ivanov.livejournal.com (last accessed on 26 July 2015)
26   Note: the positions of villages are not necessarily identical on all NSDC maps and that the situation maps from the Kot Ivanov blog, which depicts a longer period of time compared to NSDC's daily maps
27   It is not within the scope of this report to assess the validity of the situation maps
28   cf.: http://ukraineatwar.blogspot.nl/2014/10/ukrainian-company-driving-from.html (last accessed on 26 July 2015)

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Border Region under Consideration

Six[29] Ukrainian regions are conterminous with Russia, with the total length of the border being around 2000 kilometers. However, only parts of the Luhansk and Donetsk regions are directly affected by the Russian-Ukrainian war. The extent of Ukraine's control over the border in these areas fluctuated over the course of the conflict in the summer of 2014. In early July 2014, the Ukrainian army appeared to maintain some degree of control over large stretches of the border area in the Luhansk region based on the presence of Ukrainian camps in the area.

This changed with the attacks on the Ukrainian military camps in the area in July 2014 and the later offensive by Russian forces. By the end of the summer, Ukraine had lost control over the entire border area in the conflict zone. To date, slightly less than half of the border area in the Donetsk and Luhansk regions remains outside of Ukrainian control. It should also be noted that two border crossings in the conflict zone (Donetsk [Russia] and Gukovo) have been under observation by the Organization for Security and Cooperation in Europe (OSCE) since July 2014.[30]

The Russian military buildup in the border region is well known and documented. Two major training camps have been previously identified:[31] the first is near Persianovskiy, 45 kilometers northeast of Rostov-on-Don, and the second is near Kuzminka, 40 kilometers northwest of Rostov-on-Don. The distance to the border is approximately 45 kilometers for both camps. Soldiers known to be in the Kuzminka camp were reportedly in Ukraine and participated in the war.[32] Close to the border, sometimes only at a distance of roughly 100 meters, additional Russian military camps have been identified.

One location with such bases is the area near the border between Donetsk (Russia) and Gukovo, and a second is the area around Kuybyshevo. While the camps in these areas are smaller than the two major camps, the sheer number of camps that were identified make these areas distinct. It is also possible to find a connection between these forward camps close to the border and the cross-border attacks on Ukrainian positions as well as the Russian soldiers who have fought (and died) in Eastern Ukraine.[33]

For the purpose of the analysis presented in this report, the border area was divided into five zones where cross-border traffic was identified: Donetsk (Russia), Dolzhanskyi, Kuybyshevo, Krasnodarovskiy, and Maksimov. Figure 3 below depicts the five zones as well as some of the Russian camps in the considered area, border crossings in the area, and the two border crossings observed by the OSCE.

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29   Chernihiv, Sumy, Kharkiv, Luhansk, Donetsk, Crimea
30   cf.: http://www.osce.org/om (last accessed on 26 July 2015)
31   cf. e.g.: http://aco.nato.int/statement-on-russian-main-battle-tanks.aspx (last accessed on 14 September 2015)
32   cf. e.g.: http://www.theguardian.com/world/2015/mar/25/russia-ukraine-soldier (last accessed on 25 July 2015)
33   cf.: http://www.atlanticcouncil.org/en/publications/reports/hiding-in-plain-sight-putin-s-war-in-ukraine-and-boris-nemtsov-s-putin-war and
       https://www.bellingcat.com/news/uk-and-europe/2015/02/17/origin-of-artillery-attacks/ (last accessed on 25 July 2015)

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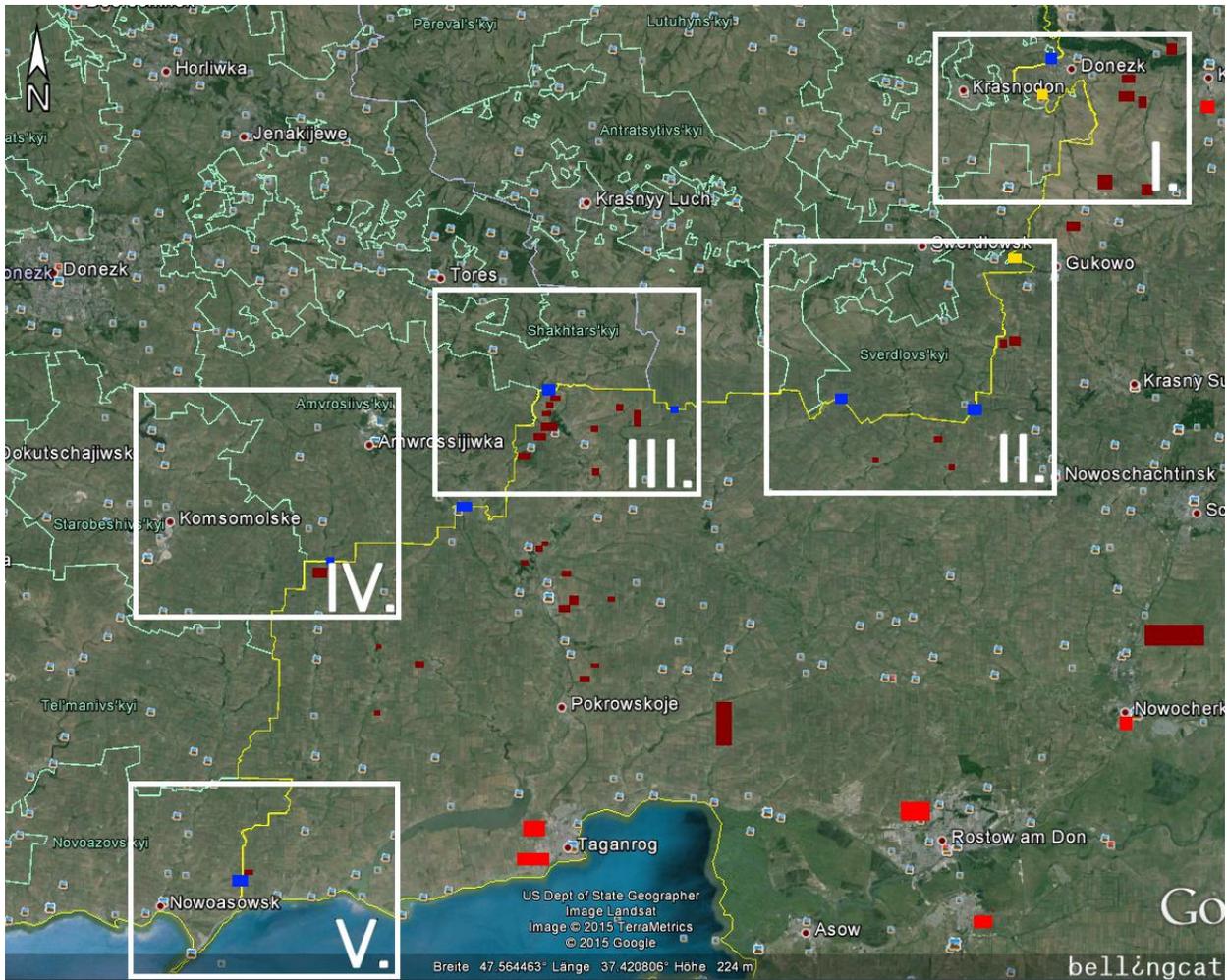
Figure 3: Border region in the conflict area; white: regions (zones) created for purposes of the analysis (I. Donetsk [Russia], II. Dolzhanskyi, III. Kuybyshevo, IV. Krasnodarovskiy and V. Maksimov); dark red: temporary Russian military camps in the summer of 2014; red: known Russian military bases; blue: border crossings; yellow: border crossings observed by the OSCE; this representation is not necessarily exhaustive.

Presentation of Selected Border Crossings by Region

In the following subsections, each of the zones introduced in figure 3 will be considered independently. The main source of information for this report is satellite imagery of each of the areas. Most of the imagery originates from Digital Globe, but because each individual source of satellite imagery has only a limited amount available, different sources were used, sometimes in combination, in order to obtain a more complete picture of the situation. The sources used are Google Earth, Yandex,[34] Bing, and TerraServer. While the first three are free map tools, the latter is a vendor of Digital Globe imagery; the report relies solely on the free previews available from TerraServer. The imagery previews available through Digital Globe are also used in some instances.[35] Additional information stems from social media accounts, geotagged photographs, and various press reports.

This report's analysis primarily concentrates on the period of July through September 2014. Not only did pivotal military operations and the alleged participation of Russian forces occur during this timeframe, but it is also the most likely timeframe in which border breaches in the considered zones could be identified. In general, border breaches that occurred via existing border crossings are hard to prove with satellite imagery, as paved roads offer little in the way of visual evidence in satellite imagery. Therefore, because Ukraine still had a certain degree of control over the border area in the summer of 2014, it is reasonable to expect that border breaches also occurred in the countryside.

One difficulty associated with identifying cross-border traffic is determining the exact position of the border. Google Earth is quite unreliable in this regard; the majority of the border displayed in the considered area is not an exact representation of the border between Russia and Ukraine. To overcome this limitation, the border displayed in Yandex is also used and was manually added to Google Earth in the relevant areas. White dots visible in the satellite imagery, which are most likely border markers, are used as additional references for the exact course of the border.

Zone 1: Donetsk (Russia) Area

The area near Donetsk (Russia) comprises the first zone discussed. On the Russian side of the border, temporary military camps can be identified. Some of the larger camps are presented in figure 4. On 8 August 2014, more than 200 military vehicles can be seen in Russia near the border, while on 22 August 2014 more the 500[36] vehicles are visible. Most of the vehicles are trucks, but self-propelled artillery, towed artillery, and armored vehicles can also be recognized. Also on 22 August 2014, nine helicopters are positioned close to the military camps. A direct comparison between 8 August and 22 August is difficult, because the area covered by the satellite imagery is not identical.

The largest official border crossing in the area has been observed by the OSCE since July 2014. The first Russian aid convoy entered Ukraine on 22 August 2014 via this border crossing. A second official border crossing is located north of Donetsk (Russia). There are also a number of dirt roads in the area that cross the border. While some of these tracks are visible

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34   A Russian internet company
35   The previews from Digital Globe were also used to determine the dates of the imagery available from Yandex and Bing
36   Not including the trucks of the Russian aid convoy

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before 2014, others are new and/or are accompanied by evidence indicative of military cross-border traffic, as will be discussed later in the report.[37]

Figure 4: Russian temporary military camps in the Donetsk (Russia) zone: top left: 48.290234, 40.095954 (8 August 2014); top right: 48.319667, 40.095368 (22 August 2014); bottom left: 48.169758, 40.031783 (8 August 2014); bottom right: 48.286837, 40.124228 (22 August 2014); source: Google Earth

Severnyi Area

An official border crossing is located south of Severnyi, where a number of dirt roads can be seen traversing the border. Because it is likely that the area south of Donetsk (Russia) was at least partially controlled by the Ukrainian army in July 2014, the border north of Donetsk is a likely area for cross-border traffic so as to avoid contact with the Ukrainian army.[38] It is also a possibility that the Buk M1 seen in Snizhne, which is the main suspect for the downing of MH17, crossed the border near this village.[39]

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37 Such traffic was observed by Western journalists on 14 August 2014,
cf.: http://www.theguardian.com/world/2014/aug/14/russian-military-vehicles-enter-ukraine-aid-convoy-stops-short-border (last accessed on 27 July 2015)

38 Google Earth shows military camps at 48.26307, 39.825969 and 48.210673, 39.822386, both of which are connected with known Ukrainian camps by dirt roads. The NSDC situation maps show a defensive position in July in the same area (see figure 1).

39 cf.: https://www.bellingcat.com/news/2015/03/30/draft-new-facts-on-mh17-from-the-joint-investigation-teams-call-for-witnesses/ (last accessed on 26 July 2015)

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Some of the tracks visible in the area already existed on 15 May 2014. However, two areas show distinct tracks crossing the border that emerged after 15 May 2014. The first area, presented in figure 5, is close to the village. Google Earth and Yandex do not show the same course of the border in the area. The more western border presented in figure 5 originates from Yandex and is the more plausible course.

Figure 5: Border traffic near Severnyi (48.352967, 39.942758): top left: 27 April 2013; top right: 15 May 2014; bottom left: 8 August 2014; bottom right: 31 August 2014; source: Google Earth

A minor track is already visible in this area in 2013. In May 2014, a track can be seen coming from the southeast and parallel tracks are visible going from east to west. The August 2014 satellite imagery does not show the tracks visible in May 2014, but a new dirt road that crosses the border is clearly visible in the area. The size of the road indicates considerable cross-border traffic between May 2014 and August 2014. A field of tracks is also visible near the border in the 8 August imagery. The imagery from August reveals that this road was still used between 8 August and 31 August, as there are new tracks leading to the tree row north of the road. These tracks are already recognizable in the 21 August satellite imagery from TerraServer, which further narrows the date of their creation. While there are no military vehicles visible in the available satellite imagery, the tracks leading to the tree row indicate that there were vehicles needing cover, a point underscored by the fact that the tracks were created during the period that saw the most intense fighting in Eastern Ukraine.

Two roads north of the area would also allow vehicles to cross the border. Both lead to the road that is also connected with the dirt road mentioned above. There are also additional tracks that cross the border in an area one kilometer west of the area discussed above. Some of the tracks were already visible in 2013; others are clearly new and came into existence in August 2014.

A second likely point of cross-border traffic is presented in figure 6. This area is around 1.7 kilometers west of the official border crossing in the area. The course of the border in this area is defined by a tree row. In 2013, there are already tracks visible in the area. A track in the western area is visible on 15 May 2014. In August 2014, new tracks in the eastern area are visible, and the course of the western track indicates that this dirt road was used between May and August 2014. A comparison between the August imagery again shows that there was cross-border traffic between 8 August and 21 August in this area. A new track is visible in the eastern part of the area. In addition, new traces are recognizable near the path leading to the north on the Ukrainian side of the border. Altogether, there are three visible paths

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leading north; two of them merge later and lead to Bilen'ke,[40] and the third leads to Severnyi. The roads leading to Bilen'ke are more pronounced. Therefore, it seems plausible that they represent the primary path used to cross the border. In summary, the area west of Severnyi shows three tracks crossing the border; two were used between May and August, and a third was created in August.
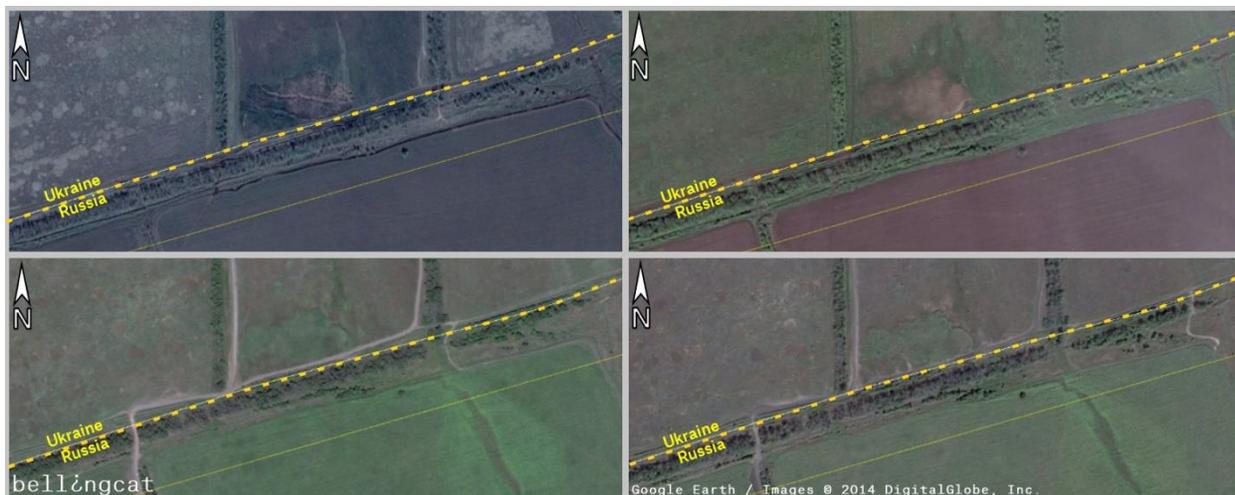

Figure 6: Border traffic west of Severnyi (48.337738, 39.897410): top left: 27 April 2013; top right: 15 May 2014; bottom left: 8 August 2014; bottom right: 31 August 2014; source: Google Earth

Mykyshivka Area

Figure 7 presents the second area featuring a major dirt road that leads between Russia to Ukraine. This area, located south of Donetsk (Russia), is sparsely inhabited. The point where the dirt road crosses the border is around four kilometers east of the Ukrainian village Mykyshivka and, on Russia's side of the border, 1.6 kilometers northeast of a small farm. Satellite imagery from 15 May 2014 is only available for parts of the area and does not cover the border area. The border depicted by Yandex is farther to the west than the border depicted in Google Earth and closer to the border markers. Therefore, the Yandex border is again a more accurate representation of the course of the border in the area.

Figure 7: Border traffic east of Mykyshivka (48.244197, 40.009773): top left: 10 May 2013; top right: 8 August 2014; bottom left: 22 August 2014; bottom right: 27 August 2014; contrast and tone of enlarged area adjusted; source: Google Earth

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40   Ukraine reported a border crossing near this village on 20 July 2014. cf.: http://mediarnbo.org/2014/07/21/nsc-news-analysis-center-briefing-at-12-00-july-20-2014/?lang=en (last accessed on 28 July 2015)

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In 2013, there are tracks visible that cross the border. Tracks crossing the border at the same spot are again visible in the 8 August 2014 imagery. Just beside the old tracks already visible in 2013, a more pronounced new track can be discerned slightly south of the old track on that date. On 22 August 2014, this track is wider and more pronounced. New tracks near the main dirt road are visible on 27 August 2014, indicating that between 8 August and 22 August 2014 the existing path was extensively used, and that there was traffic on this road between 22 August and 26/27 August. Following the path on both sides of the border allows, together with satellite imagery from other sources, a better understanding of the area.

In addition to 26 August imagery available on Google Earth discussed below, TerraServer also has imagery of the area from 21 August 2014 and from 11 September 2014. The 21 August imagery indicates that the widened road visible on 22 August in Google Earth in the border area was already in existence on 21 August. Figure 8 presents a comparison between the 27 August imagery from Google Earth and the 11 September imagery from TerraServer. While most of the border region is covered by clouds, a small part of the area close to the dirt road is partially visible, and objects can be identified. The enlarged version allows for a better identification of the objects; they are most likely vehicles parked on the Ukrainian-Russian border. This strongly indicates that the road was still in use on 11 September.

Figure 8: Border traffic east of Mykyshivka (48.244197, 40.009773); comparison between 27 August 2014 and 11 September 2014; both images show the exact same area; an area with visible objects on the border is enlarged for the 11 September 2014 imagery; contrast and tone of the enlarged area was adjusted to allow a better identification of the visible objects; sources: Google Earth (left), preview imagery from TerraServer (right)

Following the road deeper inside Russia leads to a temporary Russian military camp[41] north of a small farm. The available imagery is presented in figure 9. On 8 August 2014, there are no visible traces of the camp. The 21 August imagery from TerraServer is noteworthy, because it indicates that the construction of the camp started on that day. This impression is supported by the 22 August imagery from Google Earth, which shows a camp that already looks to be more established. On both dates, vehicles can be clearly identified in the area of the camp. The visibility in the area is again hindered by cloud cover on 11 September. However,

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41   Egor Vinkler, a Russian soldier, uploaded an image on 4 September 2014 with a geotag pointing to this area. Other images from his account document that he is an active serviceman of the Russian army,
c.f. https://archive.is/5btLB, https://archive.is/T2Hbq, and https://archive.is/ugbSJ (last accessed on 4 August 2015)

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it is possible to identify vehicles near the camp and objects (most likely tents) not visible on 22 August. This indicates that the camp was still in use. From this camp, the road leads further east to Volchenskiy. On the way to the village, there are traces of temporary camps or areas where vehicles had been parked.[42]

Figure 9: Temporary Russian military camp near the path to the border (48.249502, 40.032305): top left: 8 August 2014; top right: 21 August 2014; bottom left: 22 August 2014; bottom right: 11 September 2014. The frame in the 11 September 2014 imagery shows a group of vehicles 250 meters west of the camp (48.249723, 40.028027); contrast and tone adjusted; sources: Google Earth (8 August and 22 August), preview imagery from TerraServer (21 August and 11 September)

Following the road inside Ukraine leads to an area 1.5 kilometers east of Mykyshivka. This area is interesting because additional information about the usage of the road can be extracted from the available satellite imagery (see figure A1 in the appendix). The TerraServer imagery from 21 August 2014 confirms that the road was already being used on this date. There is also clear visual evidence that the road was used between 21/22 August and 26 August. The visual evidence between the dates is stronger in this area than in the area close to the border. The 27 August imagery shows that there was additional traffic on this road between 26 and 27 August. Additional imagery from 31 August 2014 and 11 September further proves that the road was also used between 27 August and 31 August and between 31 August and 11 September. From this point, the road leads farther west to Mykyshivka and then to a paved road west of the village. This road leads north to the village of Vlasivka, which is south of Isvaryne. The complete path of the dirt road from Volchenskiy to Mykyshivka is presented in figure A2 in the appendix.

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42   The coordinates of the two areas are 48.242136, 40.059590 and 48.240968, 40.091194. Both are visible on 22 August 2014, but not on 8 August 2014, which indicates that there may be a connection between these areas and the widened road

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In summary, the road discussed, which leads from Russia to Ukraine, was heavily used in the second half of August. The Russian camp nearby indicates that there is a plausible connection between the road and the Russian military. It is possible to identify vehicles on the border through what is most likely the first publicly available satellite imagery of vehicles situated on the border near a Russian military camp in this conflict.

Further Information Regarding the Donetsk (Russia) Area

There are additional areas around Donetsk (Russia) where tracks lead from Russia to Ukraine. In total, more than 20 such tracks and/or roads were identified. In some of the areas, the tracks were already visible before 2014, indicating that crossing the border via unofficial dirt roads was not an uncommon occurrence. Nonetheless, some of these tracks are interesting, four of which are presented in figure 10.
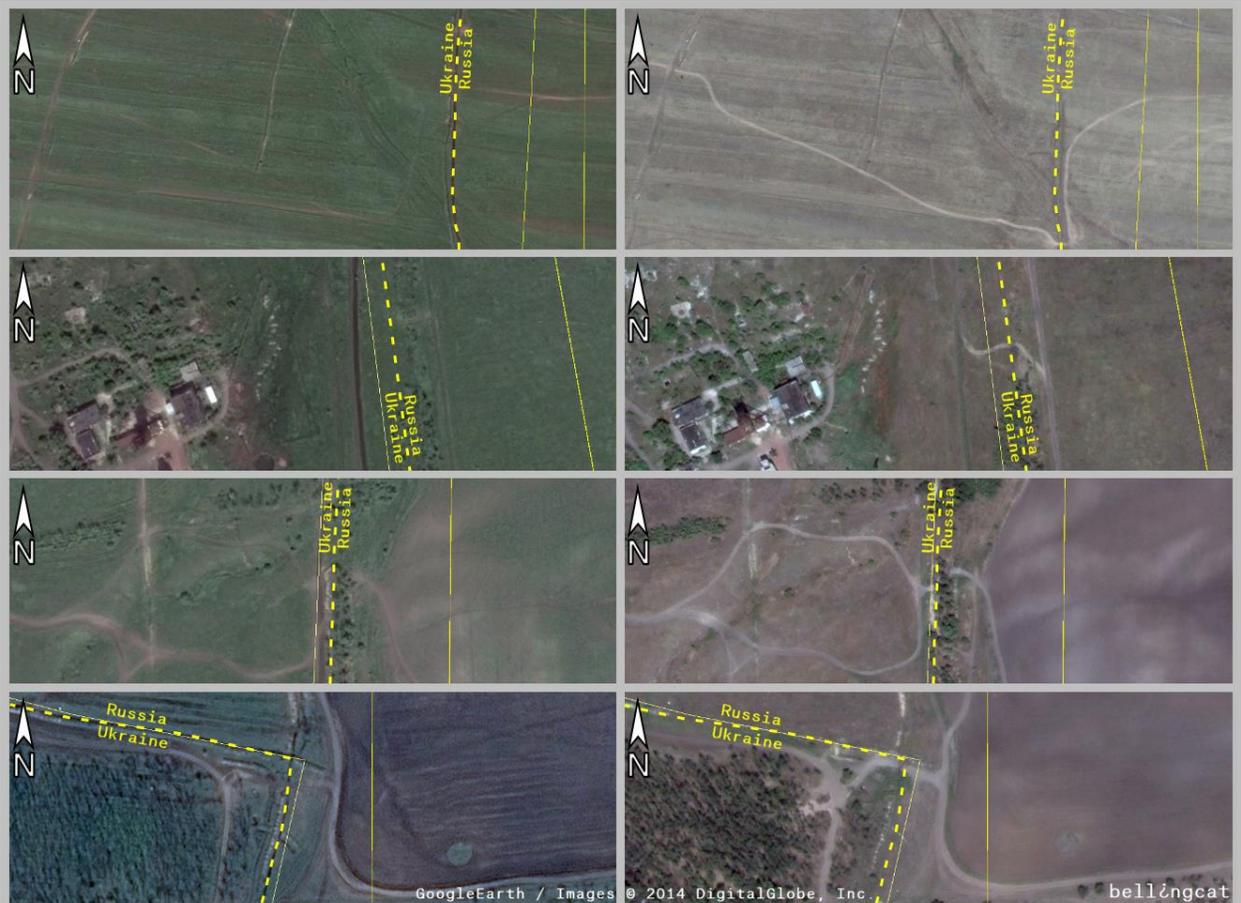

Figure 10: Other unofficial border crossing near Donetsk (Russia): the left column presents 15 May 2014 satellite imagery; the right column presents 8 August 2014 imagery; from top to bottom: 48.201315, 39.939087; 48.328030, 39.840404; 48.317986, 39.841512; 48.307034, 39.888135; source: Google Earth

The track crossing the border in the first row is south of Mykyshivka. It is likely that neither Yandex nor Google Earth depicts the correct border in this area given that border markers are clearly visible west of both borders. The dashed lines represent an alternate interpretation of the course of the border using visible terrain features. In any case, there is a track leading from Russia to Ukraine that crosses through all possible courses of the border. The 8 August imagery also indicates that there was traffic toward the border after 15 May 2014. This area is interesting in light of traces that indicate a former artillery position east of the border.

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Furthermore, there are craters inside Russia 2.2 kilometers northeast of the area. Together, this strongly suggests that the Russian military was deployed in the area.

The second and the third rows present unofficial border crossings west of Donetsk (Russia). The northern path (second row) is not visible on 15 May 2014 but can be clearly identified on 8 August 2014. Later satellite imagery provides visual evidence that the border in this area was also crossed after 8 August. The southern path (third row) was already visible on 15 May 2014. However, the roads visible on 8 August are more pronounced. A field of craters visible on 8 August, located only 700 m west of the border crossing, can be interpreted as an indication of military cross-border traffic in this area.

The last row shows an unofficial border crossing southwest of Donetsk (Russia). There was already a small path over the border in this area on 15 May 2014, but the path is more pronounced on 8 August 2014. The path through the field in Russia also changed between these two dates, indicating that the area was used in the meantime. Following the track inside Ukraine leads to Isvaryne.

Figure 11 presents an overview of all identified border crossings in the area. Most border crossings are close to Donetsk (Russia). However, there are also border crossings in the sparsely inhabited southern area. While the OSCE observed the traffic at one of the official border crossings in the area, the figure illustrates that this does not imply that the traffic from Russia to Ukraine was completely controlled.
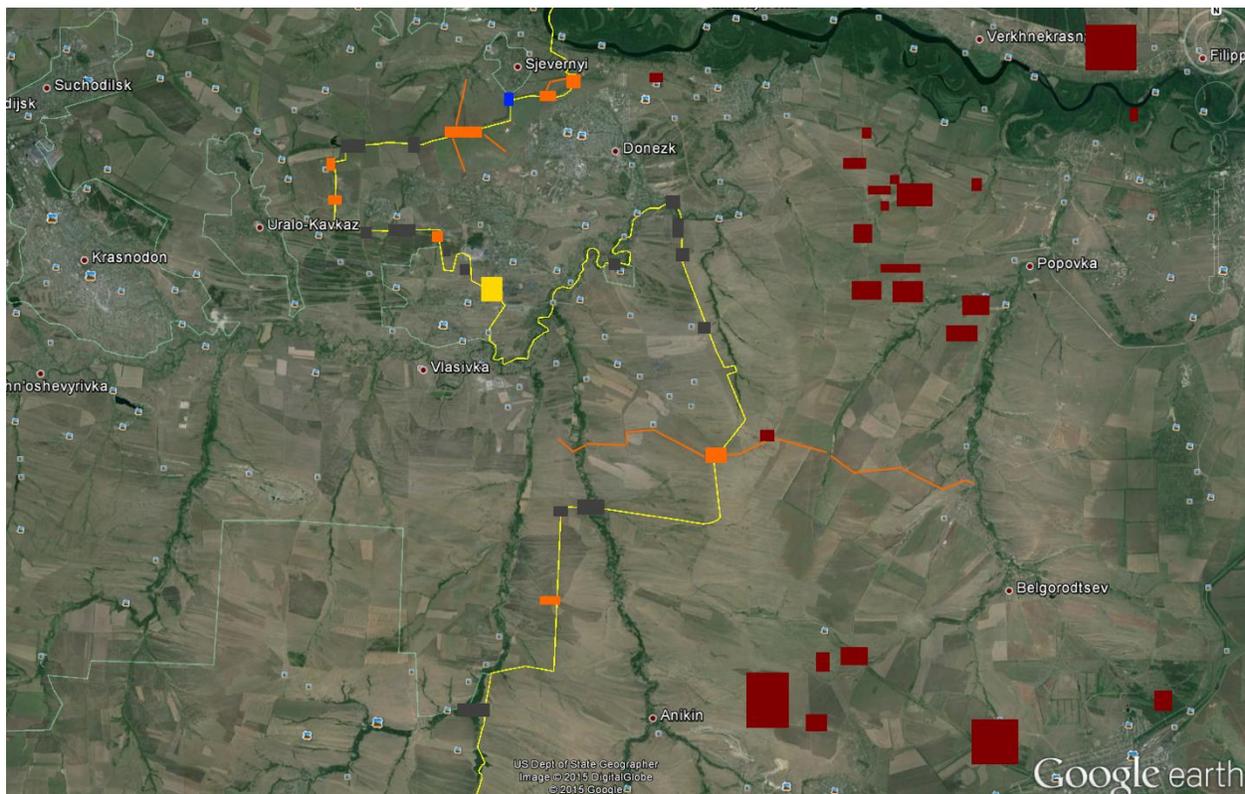
Figure 11: Overview of Zone I, Donetsk (Russia): Orange: discussed border crossings; orange paths: identified routes connected with the border crossing; gray: unofficial border crossings in the area not discussed in this report; yellow: the Donetsk (Russia) border crossing observed by the OSCE; blue: official border crossing not observed by the OSCE; dark red: temporary Russian military camps; sources: Google Earth and author's data

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Zone 2: Dolzhanskyi Area

The second considered zone is the area around Dolzhanskyi. The northern border of the area is defined by Gukovo and the western border by Denisovo-Alekseevka. The border crossing near Dolzhanskyi defines the center of the area. On the Russian side of the border, temporary military camps can be identified. However, the number of camps compared to the Donetsk (Russia) area is relative low. Some camps are located south of Gukovo, others southwest of Dolzhanskyi.

Military camps are also visible on the Ukrainian side of the border. These positions were most likely established by Ukraine to control the Ukrainian-Russian border, which did not go unnoticed by the Russian military: A camp near Zelenopillya was attacked on 11 July 2014,[43] and a second camp near Chervonopartyzansk came under fire from Russia on 14 July 2014. The attacks on the Ukrainian camps continued into the following weeks, forcing the Ukrainian troops to retreat in early August.[44] After the retreat, the entire border area was no longer under Ukrainian control.

Pavlovka Area

The intention of the border crossing near Pavlovka was not to enter and then move deeper inside Ukraine. Instead, the border was crossed in order to attack targets from inside Ukraine. The area is presented in figure 12.

Figure 12: Border traffic east of Pavlovka (47.944464, 39.805403): comparison between 8 May 2013 and 8 August 2014; the area where the border crossing took place is enlarged; source: Google Earth

Because the 8 August imagery already shows the border crossing and the last satellite imagery before this date is from 2013, sources other than Google Earth's satellite imagery must be used to determine the approximate time of its creation. However, neither Yandex, Bing, nor TerraServer have better imagery. Digital Globe has imagery for the area from 16 July and 25 July 2014. Figure 13 presents a comparison of Digital Globe's free, low-resolution preview images for 16 and 25 July 2014. On 16 July, tracks can be seen leading to the border. However, there is no evidence of the burnt area visible in the 8 August imagery from Google Earth. The 25 July imagery, however, shows a dark spot in the exact same area. Therefore, it can be concluded that the attack occurred on or before 25 July and most likely[45] after or on 16 July 2014.

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43   cf.: http://www.unian.net/politics/938616-terroristyi-iz-gradov-obstrelyali-pozitsii-sil-ato-est-soobscheniya-o-gibeli-ot-30-do-50-voennyih.html and http://ukraineatwar.blogspot.co.uk/2014/07/drama-near-zelenopole-entire-ukrainian.html (last accessed on 27 July 2015)

44   cf.: https://www.bellingcat.com/news/uk-and-europe/2015/02/17/origin-of-artillery-attacks/ (last accessed on 25 July 2015)

45   Due to the low resolution of the imagery provided, it cannot be definitively concluded that no attacks were carried out in the area before 16 July 2014; however, because both preview images from Digital Globe show nearly the same details, it is most likely that the attack occurred after 16 July 2014.

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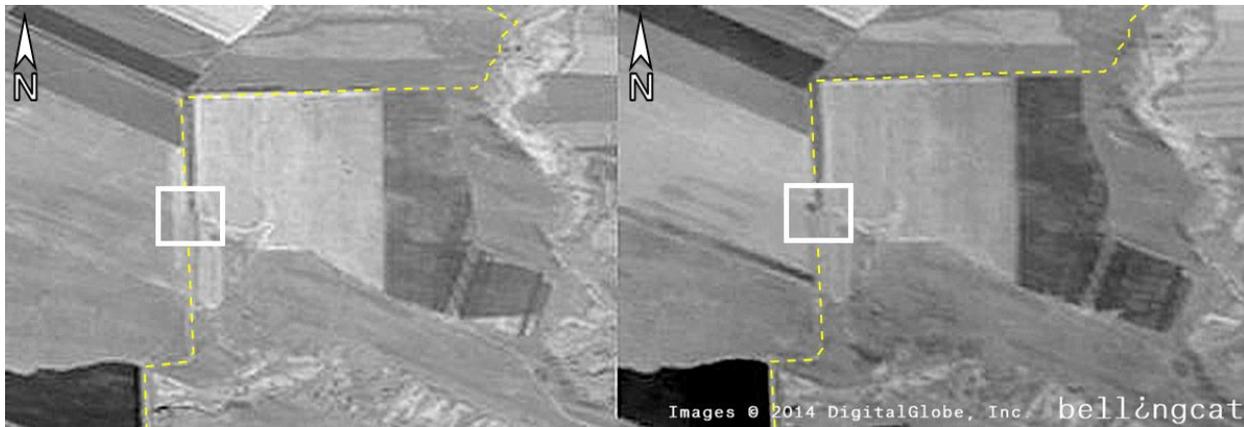
Figure 13: Border traffic east of Pavlovka (47.944464, 39.805403): comparison between 16 July 2014 and 25 July 2014; contrast and tone of the imagery from 25 July 2014 was adjusted to ease the comparison; source: Digital Globe

The Google Earth imagery from 8 August 2014 provides a clear indication of what happened in the area. The burnt area closely resembles the scorch marks created by multiple launch rocket systems (MLRS). The scorch marks suggest that attacks were launched in two different directions: One in roughly a north-northwesterly direction, while the second was west-northwest. Both attacks were in the direction of areas in which Ukrainian camps were based. The border crossing is documented by the visible tracks connecting the scorch marks with the track near the border. Following the track from the border deeper inside Russia leads to Russian military camps near Pavlovka.

The large, main camp in the area already existed on 1 July 2014; it is clearly visible in the Digital Globe preview imagery for this date. Furthermore, this camp can be clearly associated with the Russian army because of images from this area uploaded by Russian soldiers to their social media accounts. One of the Russian soldiers with a geotagged and geolocated photograph from the Pavlovka area is named Stanislav Tarasov. He uploaded a photograph from the area on 18 June 2014.[46] In addition to the aforementioned attack from within Ukraine, it was also possible to identify cross-border attacks originating from Russia in the area surrounding the Pavlovka camp.[47]

Klunykove Area

A second area in which Russian forces crossed the border to launch attacks from inside Ukraine is near Klunykove. This area has been linked to the attack on Zelenopillya on 11 July 2014.[48] The situation in the area is presented in figure 14. The border depicted in Google Earth is again not an exact representation; Yandex's border, however, closely follows the tree row and can therefore be considered a more exact representation. More than 20 scorch marks typical of MLRSs are visible in a field on the Ukrainian side of the border. Tracks near the scorch marks can be seen leading east and then south toward the border. At the southern end of the tree row, one track can be seen clearly crossing the border. Google Earth only has 2011 and 31 August 2014 imagery from this area. TerraServer has imagery from 15 August 2014, which shows that this track was created prior to that date. The scorch marks in the field are also visible in this imagery. A second track crossing through the tree row and across the

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46   cf.: http://www.atlanticcouncil.org/en/publications/reports/hiding-in-plain-sight-putin-s-war-in-ukraine-and-boris-nemtsov-s-putin-war (last accessed on 25 July 2015) and https://www.bellingcat.com/resources/case-studies/2015/05/28/geolocating-stanislav-tarasov/ (last accessed on 27 July 2015)

47   cf.: https://www.bellingcat.com/news/uk-and-europe/2015/02/17/origin-of-artillery-attacks/ (last accessed on 25 July 2015)

48   cf.: http://ukraineatwar.blogspot.nl/2015/01/google-earth-shows-russians-crossed.html (last accessed on 27 July 2015)

border slightly north of the southern track, however, is not visible on this date. Therefore, these tracks must have been created between 15 August and 31 August 2014.

Figure 14: Border traffic south of Klunykove (47.867054, 39.348675): comparison between 15 July 2011 and 31 August 2014; the area of the border crossing and some scorch marks are enlarged; contrast adjusted for the enlarged 31 August to ease identification; source: Google Earth

The TerraServer imagery only provides evidence that an attack occurred prior to 15 August 2014. A search in the Digital Globe database revealed that there is additional imagery available from the area. Because the alleged attack from this area is thought to have happened on 11 July 2014, only the imagery of the first half of July was considered. Figure 15 presents the preview imagery from 1 July, 11 July, and 16 July. Nothing of note is visible in the 1 July imagery. The imagery for 11 and 16 July, however, reveals the tracks in the field seen in the Google Earth and TerraServer imagery from August. Lighter spots in the field west of the tracks (the same area in which the scorch marks appear in the August imagery) indicate that the attack happened on or before 16 July. Similar traces are not visible in Digital Globe's 11 July preview. Note, even if Digital Globe preview imagery made it possible to identify the tracks and scorch marks, because of the low resolution of the preview imagery, no visual evidence does not necessarily prove that there were no tracks or scorch marks on that date. However, the change of color of the field between the 11 July and the 16 July imagery strongly indicates that some sort of event took place in this area between these two dates.
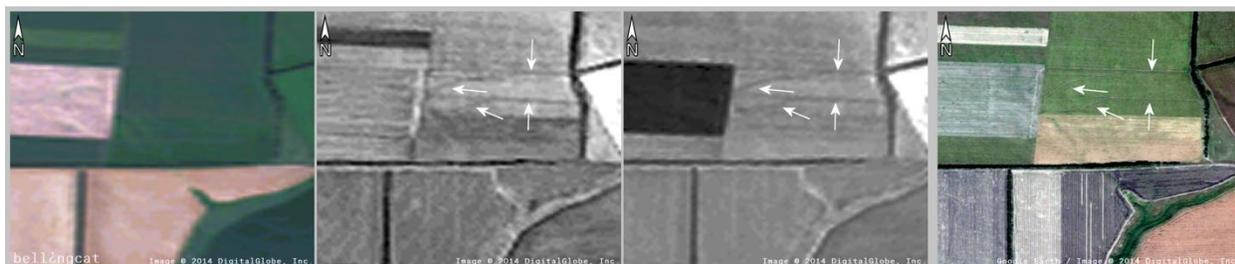
Figure 15: Digital Globe preview imagery from the area south of Klunykove (47.867054, 39.348675): comparison of 1 July 2014, 11 July 2014, and 16 July 2014 (from left to right); 31 August 2014 Google Earth imagery far right used as a reference; contrast and tone image adjusted; sources: Digital Globe (1 July, 11 July and 16 July 2014), Google Earth (31 August 2014)

The Digital Globe imagery, therefore, provides additional evidence that the attack on the Ukrainian camp near Zelenopillya was launched from this area. It has already been shown elsewhere[49] that the craters near the camp point to this area and that the scorch marks on the east side of the field also point to the camp. The Digital Globe imagery makes it possible to further narrow down the time of the attack launched from this area. Additionally, a second

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49   cf.: http://ukraineatwar.blogspot.nl/2015/01/google-earth-shows-russians-crossed.html (last accessed on 27 July 2015)

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Digital Globe preview image from 11 July depicting the region east of the area (including the Ukrainian camp) shows craters and burnt fields. Compared with the 16 July preview, the area of burnt fields is smaller in the 11 July imagery, indicating additional attacks had taken place in the meantime and/or fields were still burning on 11 July 2014. Because the tracks from the field lead to the border and a track crossing the border is clearly visible, Russia is the most likely country of origin of the vehicles conducting this attack.

In the western part of the field, scorch marks depicting outgoing fire in a westerly direction indicate a second attack direction. Because the latest Google Earth imagery west of the area has not been updated since 2011, the likely target of this attack was determined using TerraServer imagery and Digital Globe previews. Figure 16 presents the situation near the likely target area, which is close to a Ukrainian camp roughly 14 kilometers west of the launch site. The 11 July 2014 imagery does not show craters in the area. However, a massive field of craters is visible on 16 July 2014. The TerraServer imagery from 15 August 2014 shows that the craters in this area only point in one direction – east toward the area with scorch marks.[50] Therefore, this attack on a Ukrainian position can also be connected with the border breach south of Klunykove.

Figure 16: Likely target area (47.883763, 39.140712) of the attack with scorch marks pointing in a western direction in the area south of Klunykove (47.867054, 39.348675): comparison between the 11 July 2014 (left) and the 16 July 2014 (middle) preview from Digital Globe; the right image shows a detail of the area on 15 August 2014; the displayed area is marked white in the Digital Globe preview; sources: Digital Globe (11 July and 16 July 2014), preview imagery from TerraServer (15 August 2014)

It is even possible to find evidence of the Russian army's presence in the area. One VK account, by a soldier named Frank Masson,[51] features pictures taken on three different dates that are geotagged five kilometers southwest of the area with the scorch marks. The first picture was uploaded on 16 July 2014,[52] the last on 21 July 2014.[53] A picture uploaded on 18 July 2014 shows, among other things, a covered BMD-2 infantry fighting vehicle.[54]

Mayaki Area

Along with these two border breaches, a third took place four kilometers east of Mayaki. As with the others, the purpose of this border crossing was to attack Ukrainian military positions

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50 East of this field of craters, it is possible to identify other impact craters originating from other attacks in the imagery provided via TerraServer on 15 August. It is highly likely that some of the visible impact craters are a result of the reported cross-border attack on 25/26 July 2014,
cf.: https://twitter.com/GeoffPyatt/status/493400313622446081 (last accessed on 27 July 2015)
51 The geotag of the older picture in his account suggests that his home base is in or near Tula. An archived version of his profile can be found here: https://archive.is/1q7uN (last accessed on 27 July 2015)
52 https://archive.is/C7pHo (last accessed on 27 July 2015)
53 https://archive.is/PbrR1 (last accessed on 27 July 2015)
54 https://archive.is/WmieX (last accessed on 27 July 2015)

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from within Ukraine. A Ukrainian camp near Brats'ke is the likely target of the Russians' attack.[55] The area east of Mayaki is presented in figure 17.
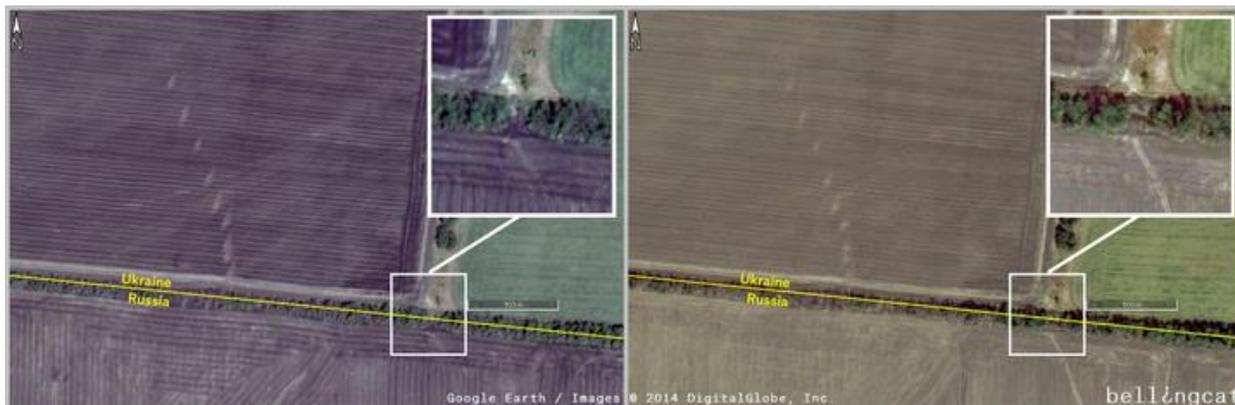

Figure 17: Border traffic east of Mayaki (47.832919, 39.670756): comparison between 15 August 2014 and 31 August 2014; the area of the border crossing is enlarged; contrast and tone adjusted to ease identification; source: Google Earth

The path crossing the border is clearly visible on imagery from 15 and 31 August 2014, though the tracks connecting the path and the scorch marks are more discernible in the latter imagery. It is again possible to narrow down the time of the attack using preview imagery from Digital Globe. Figure 15 presents some of the available[56] preview imagery for this area. On 1 July and 11 July, nothing of note is visible in the area. On 16 July, the track leading to the border is visible inside Russia. This track is also visible in the imagery from 30 July 2014, which also shows scorch marks on the field inside Ukraine. The position of these marks corresponds with the scorch marks visible in Google Earth. In addition, a track leading to the scorch marks from the border is visible. Comparing the 16 July and 30 July imagery reveals that the scorch marks had already been created by July 16. Therefore, it is highly likely that the attack occurred between 11 July and 16 July.
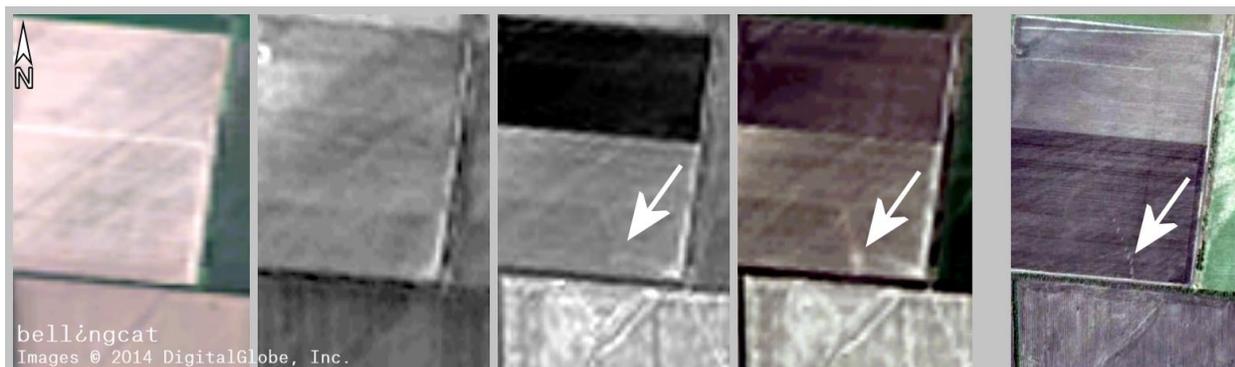
Figure 18: Digital Globe preview imagery from the area west of Mayaki (47.832919, 39.670756): comparison of 1 July 2014, 11 July 2014, 16 July 2014, and 30 July 2014 (from left to right); 15 August 2014 Google Earth imagery (far right) is used as a reference; contrast and tone of some of the images image is adjusted; sources: Google Earth (15 August 2014), Digital Globe (all others)

Three kilometers south of the area with the scorch marks, on Russia's side of the border, Russian military camps army were identified thanks to soldiers' image uploads on social media and the visible traces of these camps in Google Earth.[57] Furthermore, more scorch marks can be identified between the camps and the Russian-Ukrainian border. These scorch

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55   cf.: http://ukraineatwar.blogspot.nl/2015/01/google-earth-shows-russians-crossed.html (last accessed on 27 July 2015)
56   The imagery from 25 July 2014 is not shown because its visibility is similar to the imagery from 16 July 2014.
57   By 15 August 2015, these camps were no longer in use and had been abandoned. However, it is still possible to identify traces of the camps.

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marks inside Russia also point northward and can be connected with a field of crates close to the Ukrainian camp near Brats'ke. The scorch marks and some of the identified camps are presented in figure 19.

Figure 19: Scorch marks (far left: 47.813250, 39.685963) and three likely camp positions (from left to right: [1]: 47.817792, 39.684270; [2]: 47.803891, 39.688683, and [3]: 47.805041, 39.678874) west of Mayaki; all images are from 15 August 2014; contrast and tone adjusted to ease identification; source: Google Earth

For two of the military camps presented in figure 19, photographs uploaded to the social media accounts of Russian soldiers are available. Kolyan Zaikin, for instance, uploaded geotagged photographs close to one of the camps ([2], as shown in the figure), the earliest being uploaded on 31 July 2014. Additional images were uploaded on 16 August 2014.[58] Using satellite imagery, it is possible to establish that the camp had already been abandoned by the time these latter photographs were uploaded on 16 August. One of the pictures uploaded on 16 August provides a basis for comparison with Google Earth imagery. Matching the road layout and tent positions shown in the satellite imagery and Zaikin's photograph provides additional confirmation of the geotag. A second image from another camp (3) was posted by the Twitter account, @Euromaidan, on 24 July 2014.[59] It depicts three 2S9 NONA self-propelled artillery vehicles positioned in prepared sites. Along with the geotag accompanying the photograph, it is also possible to verify the location of the image with satellite imagery. Both examples prove that Russian soldiers were close to the Russian-Ukrainian border in this area in July and the border crossing itself.

Further Information Regarding the Dolzhanskyi Area

With the exception of the three border breaches presented above, the visual evidence for further cross-border traffic in the area is otherwise quite limited. There are tracks leading from Russia to Ukraine, but most of them are close to already existing unofficial paths. One reason for this apparent dearth of cross-border traffic could be the Dolzhanskyi border crossing. At least until the end of July, the Ukrainian military was able to execute some semblance of control over the area. But after the Ukrainian military was forced to retreat from the area, the border crossing was no longer under Ukrainian control. Even so, there is not much evidence that the border crossing was used to transport military personnel and equipment from Russia to Ukraine. The only evidence in Google Earth supporting such a claim are three military trucks on the Russian side of the border crossing on 8 August 2014.

Nevertheless, there is other evidence suggesting that border breaches might have occurred in the area. One video[60] shows military equipment in Sverdlovsk on 26 August 2014. This video became famous because it was believed to be the first time a tank unique to Russia was

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58   https://archive.is/9rCSX and https://archive.is/fRQdQ (last accessed on 27 July 2015)
59   cf.: https://twitter.com/euromaidan/status/492077508343656449 (last accessed on 27 July 2015)
60   https://www.youtube.com/watch?v=tL-yofb3HzU&feature=youtu.be (last accessed on 27 July 2015)

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identified inside Ukraine.[61] Geolocation of the video shows that it was taken near a major crossing in Sverdlovsk and that the convoy originated from the south and was traveling northwest. A comparison between a particular frame of the video and Google Earth satellite imagery is presented in figure A3 in the appendix.

Because the convoy came from the south and included a tank that was almost certainly delivered by Russia, it is possible that this convoy crossed the border in the Dolzhanskyi region. Therefore, a lack of visual evidence does not necessarily preclude additional border crossings in the area. Figure 20 presents the summary for the Dolzhanskyi area. Again, all border crossings are marked; two border crossings that are probable but not completely confirmed are marked in a different color. These latter two crossings likely took place on foot and are possibly connected with mortar attacks on the Ukrainian border crossings in the area.
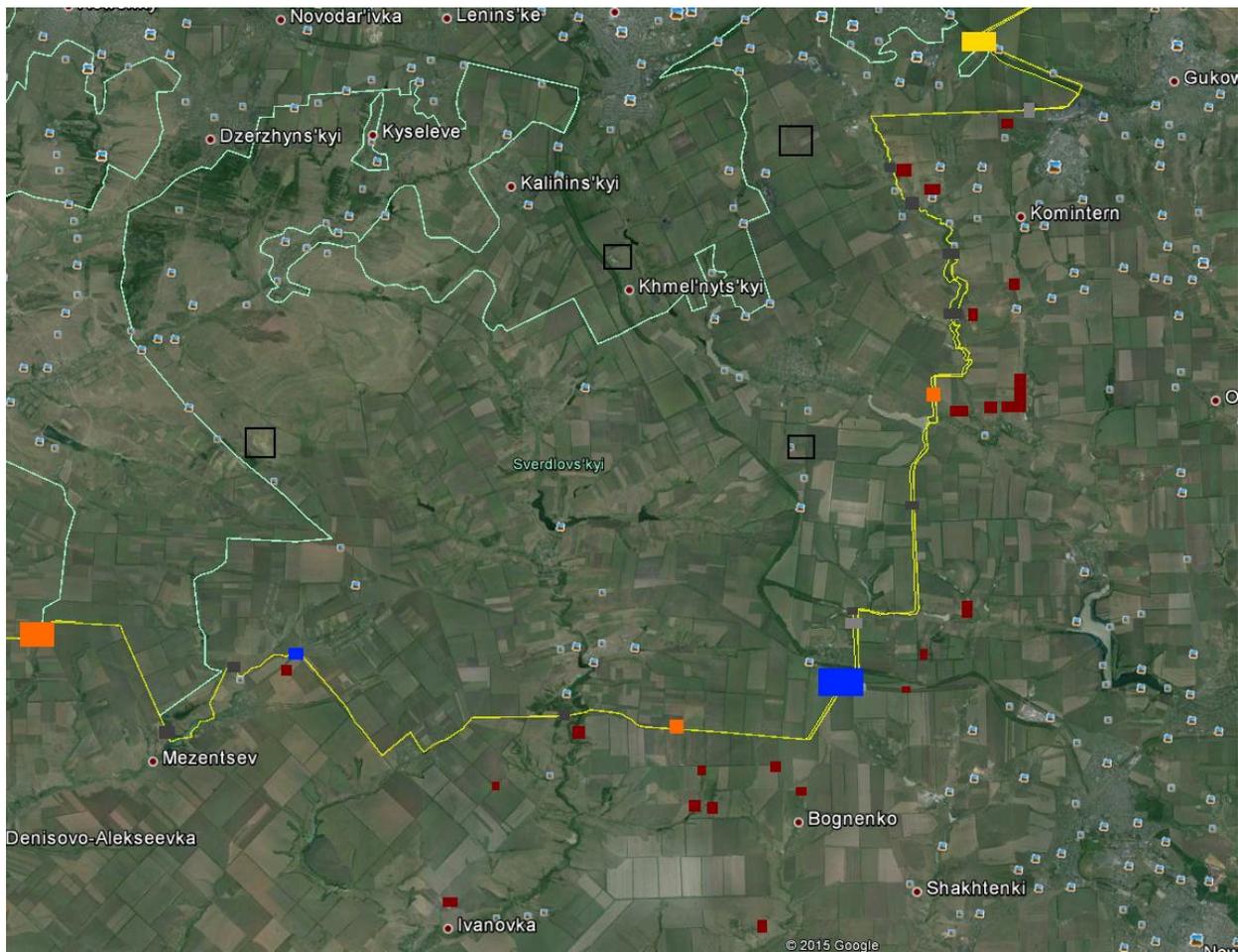
Figure 20: Overview over Zone II, Dolzhanskyi: orange: discussed border crossings; gray: other unofficial border crossings in the area not discussed in this report; light gray: likely border crossings; yellow: the Gukovo border crossing observed by the OSCE; blue: official border crossings not observed by the OSCE; dark red: temporary Russian military camps; black areas of Ukrainian camps; sources: Google Earth and author's data

61   cf.: https://www.iiss.org/en/militarybalanceblog/blogsections/2014-3bea/august-ca01/pro-russia-separatist-tank-variant-supports-russian-source-4c62 (last accessed on 27 July 2015)

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Zone 3: Kuybyshevo Area

The Kuybyshevo area, located west of Dolzhanskyi, saw some of the most intense fighting in Ukraine in July and August 2014. The downing of MH17 is most likely connected with the battle over control of the border in this region. The Kuybyshevo area was important for two reasons for both sides: If Ukraine could control the area near the official border crossing, the transport of supplies from Russia to pro-Russian forces would be hampered, and the supply route to Ukrainian forces east of the area would be open. The opposite would be true if Russian troops could gain control of the area. Control over the area changed multiple times over the summer.

It is not possible to determine with absolute certainty which side controlled the border crossing and the surrounding area from July to mid-August. Both sides made competing and mutually exclusive claims. It can be assumed[62] that, for most of the second half of July, Russian troops were able to control the area and block the supply for the Ukrainian troops near the border in the Luhansk region. After Ukraine's retreat from the border area, Ukrainian control over the border crossing was seemingly reestablished in the first half of August. Since 14 August 2014, Russian troops have regained control over the Kuybyshevo border crossing.

Figure 21: Temporary Russian military camps in the Kuybyshevo zone: top left: 47.815423, 38.867415 (15 August 2014); top right: 47.751169, 38.965310 (14 September 2014); bottom left: 47.812012, 38.851522 (15 August 2014); bottom right: 47.851495, 38.864524 (14 September 2014); source: Google Earth

The Kuybyshevo area is also the second area near the border that witnessed a massive Russian military build-up. In the area visible in Google Earth's imagery, more than 125 military vehicles can be identified on 15 August and 14 September 2014. Because the vehicles are generally parked close to trees and only a part of the region is visible in the imagery, the

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62   This is indicated by various reports, e.g.: https://twitter.com/EuromaidanPR/status/497483457237622784 (last accessed on 15 September 2015)

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provided figures should be seen as a conservative lower bound. Some of the temporary military camps are presented in figure 21.

Novaya Nadezhda Area

Novaya Nadezhda is a small village 14 kilometers east of Kuybyshevo. Two Ukrainian military camps were located north and northeast, respectively, of this village on the Ukrainian side of the border. The US reported attacks on these camps originating from positions inside Russia, a claim supported by satellite imagery.[63] As was described before, the camp northeast of Novaya Nadezhda was also attacked from the Klunykove area. An official border crossing near Chervonyi Zhovten' is roughly three kilometers east of Novaya Nadezhda.

Ukrainian officials reported that cross-border traffic in this area took place on 29 July 2014.[64] Previously unreleased satellite imagery from the area revealing border crossings and a Russian military camp were provided by the Twitter user @finriswolf in March 2015.[65] The imagery released by @finriswolf is not available in Google Earth, Yandex, or Bing; the most recent imagery from any of the three is from 2013 for this specific area. However, TerraServer offers satellite imagery from this area and Digital Globe has coverage of the area in preview form. The TerraServer imagery confirms the authenticity of the imagery posted by @finriswolf.

Figure 22 presents the main border crossing north of Novaya Nadezhda. In 2013, no path is visible in the area. On 4 August 2014, a dirt road crossing the border is clearly visible. There is also a small camp visible along with a number of vehicles northeast of the crossing near a tree row inside Ukraine. Additional tracks are visible on 15 August, indicating that the road was also used after 4 August. However, it is not completely clear if the camp close to road was still used on that date.
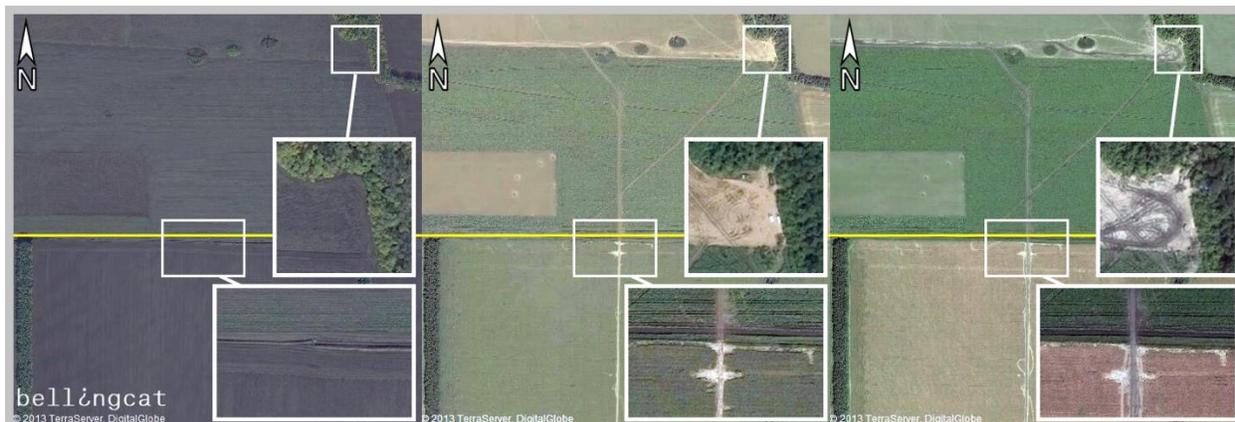
Figure 22: Border crossing north of Novaya Nadezhda (47.869858, 39.068522): comparison of 12 October 2013 (left), 4 August 2014 (middle), and 15 August 2014; the area of the border crossing and a camp near the crossing are enlarged; contrast and tone adjusted to ease identification for the August imagery; course of border added manually; source: preview imagery from TerraServer

Using preview imagery from Digital Globe (presented in figure 23), it is possible to further narrow down the time of the border crossing. In the 26 July 2014 imagery, there is no track

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63   cf.: https://twitter.com/GeoffPyatt/status/493400313622446081 and
      https://twitter.com/GeoffPyatt/status/493390505003069440 (last accessed on 28 July 2015)
64   cf.: http://www.unian.net/politics/945479-7-tankov-iz-rf-prorvalis-v-ukrainu-snbo.html (last accessed on 29 July 2015)
65   cf.: https://twitter.com/finriswolf/status/576839036037308416 (last accessed on 29 July 2015) and
      https://twitter.com/finriswolf/status/576824405768060928 (last accessed on 29 July 2015)

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crossing the border visible, while a track is clearly visible on 29 July 2014. Other tracks on the Ukrainian side are visible on both dates.[66] Imagery from 28 July 2014 does not show the track crossing the border, but because the details visible in this imagery greatly differs from that of the imagery from 26 and 29 July 2014, it cannot be confidently concluded that the border crossing took place after 28 July.

Figure 23: Digital Globe preview imagery from the area north of Novaya Nadezhda (47.869858, 39.068522): comparison of 26 July 2014, 28 July 2014, and 29 July 2014 (from left to right); contrast and tone of the images adjusted; source: Digital Globe

It is also possible to find evidence for the presence of the Russian army in the area. @finriswolf identified a Russian military camp south of Novaya Nadezhda. While this camp is not visible on 8 August 2014, imagery for 15 August shows vehicles close to the tree row revealing the camp.[67] Furthermore, a Russian soldier uploaded a geotagged photograph from this area in August.[68] This camp is neither the first nor the only documented presence of the Russian army in the area. The cross-border attacks on the Ukrainian camps reported by the US originated from a position five kilometers south of Novaya Nadezhda, indicating a Russian presence in July. Two Russian military camps situated 3.7 kilometers west of Novaya Nadezhda provide further evidence. These two camps are presented in figure 24.
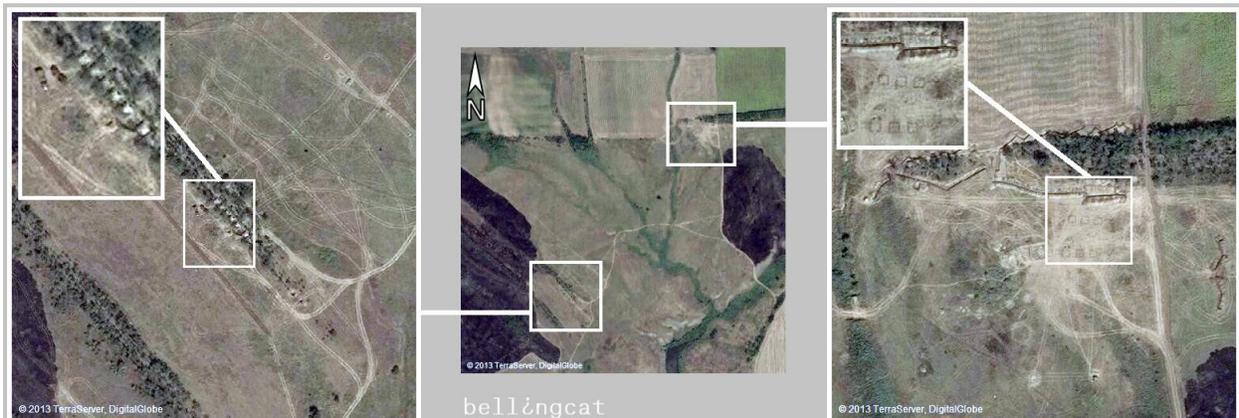
Figure 24: Area with two temporary Russian military camps west of Novaya Nadezhda (47.846495, 39.019123): satellite imagery from the area with both camps is presented in the middle; the first camp (1) is presented on the left; the second camp (2) on the right; imagery for both camps is from 4 August 2014; areas in both camps are enlarged; contrast and tone adjusted to ease identification; source: preview imagery from TerraServer

The northern camp seems to have already been abandoned by 4 August 2014, while the southern camp was still in use, given the presence of tents and vehicles. A comparison

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66   Note: the new track is visible in the 4 August Digital Globe preview, which is otherwise similar to the 26 July imagery.
67   The imagery is provided in the appendix in figure A4.
68   Both were uploaded in August: https://archive.is/gAEoS and https://archive.is/q9Kjr (last accessed on 29 July 2015)

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between imagery from 4 August and 8 August (not presented) shows new fortifications on the latter date, further indicating ongoing usage. A geotagged photograph taken by a Russian soldier near the camp area was uploaded on 21 July 2014, indicating a permanent Russian army presence in the area at least since mid-July 2014.[69]
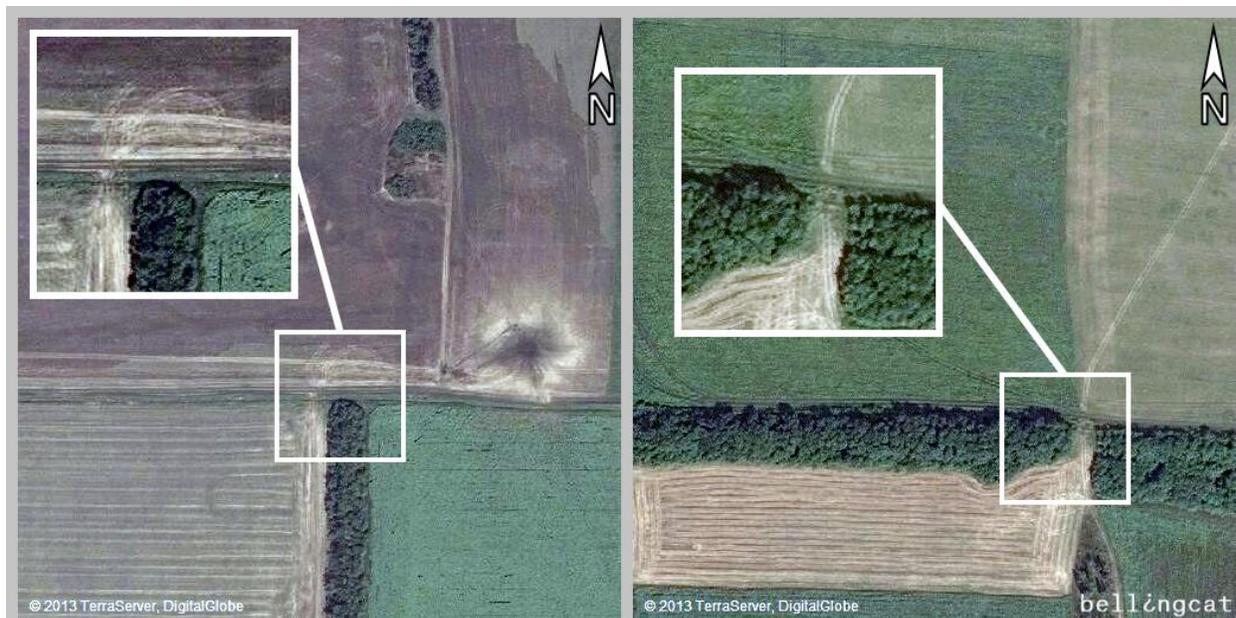

Figure 25: Two other border breaches near Novaya Nadezhda (47.870078, 39.037478 and 47.851685, 39.087057): the area of each border breach is enlarged; contrast and tone adjusted to ease identification; imagery for both areas from 4 August 2014; source: preview imagery from TerraServer

In addition to the main track crossing the border north of Novaya Nadezhda, two other border crossings are visible in the area, both of which are presented in figure 25.[70] The breach presented in the left image is west of Novaya Nadezhda. This breach is interesting because the apparent reason for the track is the explosion mark on the Ukrainian side of the border. The explosion mark is clearly visible in the Digital Globe preview imagery, and it is therefore possible to conclude that the event leading to the mark happened between 16 July and 20 July 2014. The second area with a track crossing the border is east of Novaya Nadezhda. This track is clearly visible in the available TerraServer imagery from 4 August 2014; however, it is not possible to estimate a more specific date for this border crossing. An official border crossing is also located east of Novaya Nadezhda, where the Ukrainian village Chervonyi Zhovten is located. This border crossing might have been used to transport materiel and personnel from Russia to Ukraine. While there is no visual evidence in the available satellite imagery that would support such a claim, the OSCE reported on 10 March 2015 that one of their observers found traces of tracked vehicles crossing the border in this area on 8 March 2015, therefore providing evidence of cross-border traffic.[71]

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69   https://archive.is/EvkSJ (last accessed on 29 July 2015)
70   Both were already reported by @finriswolf, https://twitter.com/finriswolf/status/576847614810796032 and https://twitter.com/finriswolf/status/576831001789218816 (last accessed on 30 July 2015)
71   "On 8 March the SMM visited an area close to 'Luhansk People's Republic' (LPR) – controlled by Chervonyi Zhovten village (95 km south of Luhansk) – at the state border between Ukraine and the Russian Federation. On the road from Dyakovo to Chervonyi Zhovten (11 km's distance), there were numerous and clearly visible traces of tracked vehicles. The same traces were visible as fresh at the entrance of Chervonyi Zhovten village. In the middle of the village, the traces turned back to the main road. The SMM approached the border and observed that there were no LPR "border guards" present and that a barrier on the Ukrainian side was open. The SMM observed a wire fence along the entire length of the border. From its

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In addition to the two attacks reported by the US, there are also visible traces of other attacks originating from inside Russia in the area. Indications of at least seven different attacks on positions inside Ukraine can be seen in the area around Novaya Nadezhda. On 8 August 2014, artillery pointing northwest is visible in a field west of the village.[72] The Ukrainian camps north and northeast, respectively, from Novaya Nadezhda were heavily attacked (see figure 26), and the visible craters clearly point toward Russia.

Figure 26: Ukrainian camps near Novaya Nadezhda (47.915111, 39.084849 and 47.883881, 39.152945): imagery for left area from 4 August 2014; for right area 15 August 2014; an area of each camp is enlarged; contrast and tone adjusted to ease visibility; source: preview imagery from TerraServer

Kuybyshevo Border Crossing

The second area with visible border crossings is that of Kuybyshevo near the official border crossing itself. Google Earth imagery depicts a sizeable Russian military presence in this area. On 15 August 2014, multiple camps are visible south of the border crossing. A depot, most likely storing ammunition, is visible near Olkhovskiy.[73] Given that the Russian camps are close to the road and the border crossing, it seems very plausible that the flow of vehicles toward the border was likely controlled by the Russian military. The area on the Ukrainian side of the border was heavily contested in July and the first half of August 2014. Traces of these hostilities are clearly visible in Google Earth. Since 14 August, the border crossing has remained under Russian control.

In general, the visual evidence for the transport of military personnel and materiel via a border crossing is minimal because of the paved roads. The border crossing near Kuybyshevo is special in this regard, because there is an abnormal amount of visual evidence available in the satellite imagery. Figure 27 presents the border crossing at three different dates. There are no major differences between the courses of the border depicted in Yandex and Google Earth.

Of particular interest is the satellite imagery from 15 August 2014. It presents the situation the day after Russia gained control over the border crossing. Three important parts of the image are enlarged in figure 27. The southernmost area identifies two military trucks on the Russian side of the border crossing. Both trucks are oriented toward the border. Another two trucks with the same orientation can be found 70 meters farther south (not displayed).

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position exactly at the border line, just in front of the open barrier, the SMM observed traces of tracked vehicles on the road across the border between Ukraine and the Russian Federation." http://www.osce.org/ukraine-smm/144336 (last accessed on 30 July 2015)

72   cf.: https://twitter.com/finriswolf/status/580510942447996929 (last accessed on 29 July 2015), also visible in TerraServer.

73   See figure 21; the mentioned depot is presented in the bottom-left image.

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Figure 27: Kuybyshevo Border crossing (47.866090, 38.858356): comparison of 8 August 2013, 15 August 2014, and 14 September 2014; three areas are enlarged in the 15 August 2014 imagery; contrast and tone adjusted; source: Google Earth

The other two areas magnify the road near a group of obstacles that might have previously blocked the road. On 15 August, a path was opened, as one obstacle in the northernmost area has been moved out of the way. The open path between the obstacles was likely heavily used given the visible traces of traffic on the road. That such traffic crossing the border might have occurred is also documented by a video showing the situation on 14 August. It shows the border crossing after Russian troops took control of the area. In the background, one truck can be seen driving slowly toward the border crossing toward Russia.[74]

There are also areas with tracks crossing the border near the border crossing. A comparison of the imagery from 2013 and 15 August 2014 is presented in figure 28. The presented area is around 250 meters west of the Kuybyshevo border crossing and shows at least four tracks leading between Russia and Ukraine. The tracks are more pronounced in the version with altered contrast and tone (right). Originating inside Russia from a paved road, the tracks lead inside Ukraine; it may be that the tracks lead to the abandoned camp close to the border. It is also possible to identify other tracks leading over the border east of the border crossing.

Figure 28: Border crossings near the Kuybyshevo border crossing (47.865602, 38.854743); comparison between 8 August 2013 and 15 August 2014; right image also presents the situation on 15 August, however with heavily altered contrast and tone; source: Google Earth

Figure 29 presents another area with a more prominent border crossing located northwest of Olkhovskiy. Olkhovskiy is west of Kuybyshevo and marks the southern boundary of the main camp area west of the city. Imagery from Google Earth and Yandex is available for this area. The date of the Yandex imagery was determined using Digital Globe previews covering the area and the distinct clouds near Kuybyshevo. Each of the four images presents a different situation. In 2013, there was no track crossing the border in this area, while on 1 August 2014

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74   cf.: https://www.youtube.com/watch?v=n8BhPloUqvl (starting at 0:30); original source of information is a tweet by Julian Röpcke, see: https://twitter.com/JulianRoepcke/status/499937883130982400 (last accessed on 31 July 2015)

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a track crossing the border is clearly visible. There are no discernible differences between the 1 August imagery and the 15 August imagery (not presented). The 14 September and the 6 October imagery document that the track was also used between these dates and, therefore, after 15 August. The track visible in October in particular indicates considerable use of this path to cross the border.

In the imagery from 1 August, a track in Ukraine can be seen leading northeast after crossing the border. It is not possible to follow the path deeper inside Ukraine because this area is not covered by the imagery. The 15 August imagery shows the same track as well as the area farther northeast. It is possible to identify two likely self-propelled artillery positions.[75] This indicates that Russian troops crossed the border in this area in July 2014 to attack Ukrainian positions from inside Ukraine.

Figure 29: Border crossing near Olkhovskiy (47.815698, 38.814201): comparison of 8 August 2013 (top left), 1 August 2014 (top right), 14 September 2014 (bottom left), and 6 October 2014 (bottom right); sources: Yandex (6 October 2014), Google Earth (all others)

The September imagery of the area shows new tracks leading to the east and west on the Russian side of the border crossing. The track leading eastward can be followed to a Russian military site, namely, the aforementioned depot near Kuybyshevo. The track leading to the west eventually turns southward. It is not possible to define a clear endpoint for this track. The track visible in the October imagery follows the path of the western track from September and clearly leads to the village Svobodnyy. Two vehicles can be seen using the track heading deeper inside Russia, but it is not possible to conclusively determine whether they are military or civilian. It is possible, however, to further narrow down the date using Digital Globe preview imagery, which is presented in figure 30. The preview imagery shows that there was no track on 21 September, but by 26 September, a track had appeared.

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75   Not presented; see 47.817138, 38.816037 and 47.824237, 38.822682.

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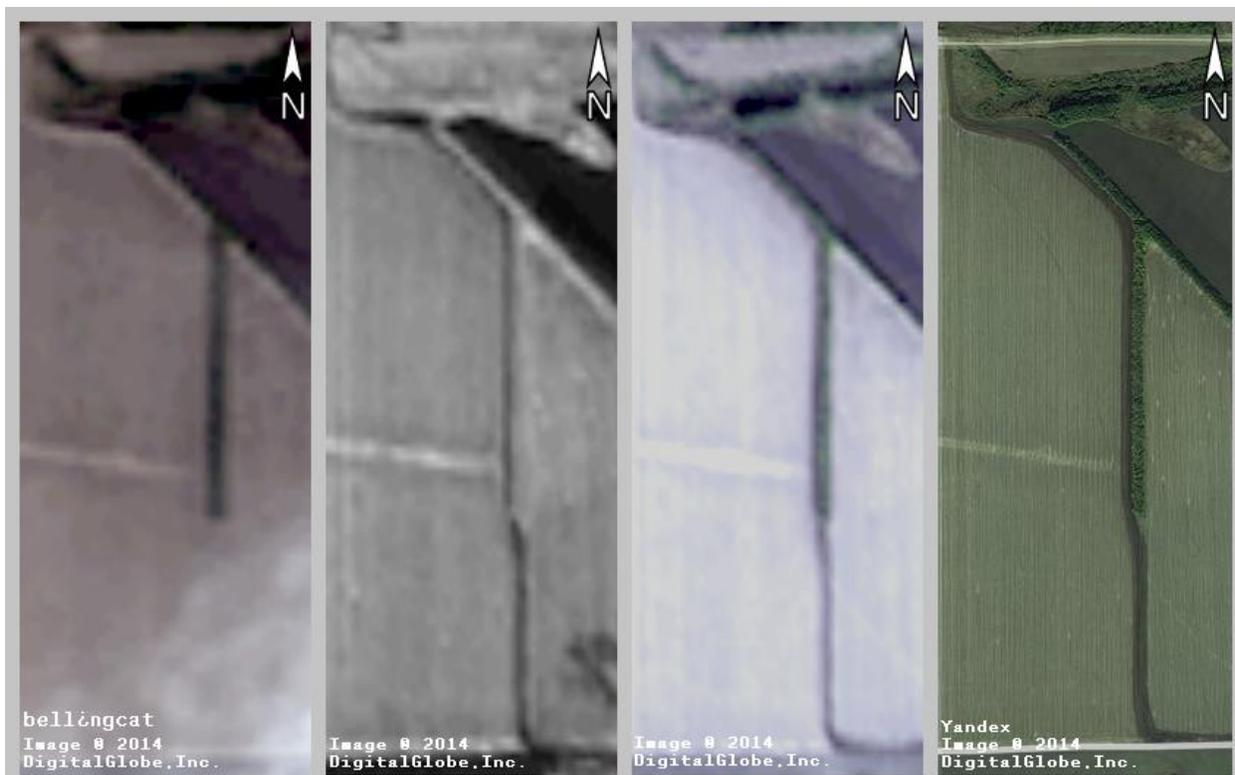
Figure 30: Southern area of the border crossing near Olkhovskiy (47.815698, 38.814201); comparison of 21 September, 26 September, 2 October, and 6 October 2014; contrast and tone of some images adjusted; sources: Yandex (6 October 2014), Digital Globe (all other dates)

The 15 August imagery provides additional clues about the situation on the Ukrainian side of the border. On this date, abandoned or destroyed camps and control posts are visible. Groups of vehicles[76] and traces of hostilities can be identified north of the Kuybyshevo border crossing, near the villages of Stepanivka and Marynivka.[77] More than 30 military vehicles can be seen, indicating a serious concentration of military hardware. Digital Globe's preview imagery again makes it possible to narrow down the date when some of the tracks and craters were created. For example, the impact craters from the attacks reported by the US[78] are visible in the 21/23 July 2014 preview imagery.[79] However, given that it is unclear as to which country's forces controlled the area, the implication of this information is vague. Detailed analysis of the situation in the area would be required to sensibly interpret the information; such analysis is not within the scope of this report.

While the traces of fighting at this location *within Ukraine* may be inconclusive with regard to the extent of Russia's participation given the uncertainty surrounding which country exercised control over the area, Russia's armed forces stationed near the border undoubtedly participated in the hostilities. This is evidenced by the traces resulting from outgoing fire from inside Russia near the military camps. The border crossing near Olkhovskiy leads to two likely firing positions inside Ukraine. The artillery position visible on 8 August 2014 near Novaya

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76   Not presented; see 47.930648, 38.838639 and 47.934732, 38.809637
77   Not presented; see 47.931087, 38.844987 and 47.926191, 38.792333.
78   cf.: https://twitter.com/GeoffPyatt/status/493400686269566976 (last accessed on 30 July 2015)
79   The 23 July 2014 imagery clearly shows the impact craters; the available 21 July 2014 preview imagery has low resolution, thereby making the details hard to identify. However, comparing the positions of areas with multiple craters allows the craters to be more easily identified through the imagery, as the scorch marks in the launch area are visible in both images.

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Nadezhda was also oriented toward this area. On 15 August, three groups of vehicles,[80] most likely self-propelled artillery, can be identified near the border in Russia and are all oriented toward Ukraine. Southwest of Svobodnyy, a military camp and artillery pointing towards Ukraine can be identified.[81] It is also possible to identify scorch marks pointing toward Ukraine[82] and traces of artillery positions in the area.[83] Imagery from 14 September 2014 depicts an artillery battery close to the border directed toward Ukraine. Nearby, a formerly used artillery position can be seen.[84] The 14 September imagery also depicts two additional areas with scorch marks typical of MLRSs as well as other formerly used artillery positions.[85]

Further Information Regarding the Kuybyshevo Area

In addition to the areas discussed above, there are a few other places in the Kuybyshevo area where cross-border traffic likely occurred. One such place is between the Kuybyshevo border crossing and Novaya Nadezhda, where, in addition to a possible border crossing, a camp can be found inside Ukraine. Both the border crossing and the camp are presented in figure 31.

Figure 31: Border crossing between the Kuybyshevo border crossing and Novaya Nadezhda (left, 47.869895 38.988388) and the identified camp in the area (middle and right, 47.870389 38.980298); left and middle satellite imagery from 4 August 2014; right satellite imagery from 8 August 2014; some parts enlarged; contrast and tone adjusted to ease identification; course of the border according to Yandex added manually; source: preview imagery from TerraServer

The left image in figure 31 presents the border crossing. The tracks clearly cross the border, as the border markers are clearly visible in the satellite imagery, and the track crosses the line defined by them. The path of the track is almost immediately lost inside Ukraine; it can only be seen leading eastward after crossing the border. Some traces of the camp just inside Ukraine are already visible by 4 August 2014. The satellite imagery from 8 August shows a slightly different situation. New tracks inside the camp are visible, but, more importantly, a number of vehicles can be identified in the area, indicating that the site was in use at that date. Note, the exact course of the border may differ from the presented course.

The summary for the Kuybyshevo zone is presented in figure 32. Again, all discussed border crossings are marked. Most of them have a northern orientation owing to the course of the border in the area. The four border crossings not discussed are places where cross-border traffic could have occurred, as all such areas have a road or a track leading to or through the border. But in these instances, the visual evidence is relatively low – either the track is barely visible or historical imagery shows that path was already in existence. In addition, impact craters can be found inside Russia in the 14 September 2014 imagery north of Primiusskiy.

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80   Not presented; see 47.859669, 38.850444; 47.828890, 38.833003; and 47.765361, 38.825901
81   Not presented; see 47.772271, 38.802838
82   Not presented; see 47.789652, 38.870704 and presumably 47.783517, 38.840608
83   Not presented; see 47.755209, 38.840066 and 47.768236, 38.856218
84   Not presented; see 47.852590, 38.918002
85   Not presented; see 47.847109, 38.924713; 47.841639, 38.924842; 47.865222, 38.915392; and 47.770669, 38.894617

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This would seem to corroborate Russian claims that shells landed north of Primiusskiy in July 2014.[86] The number of Russian camps close to the border there is enormous. Digital Globe preview imagery documents that at least some parts of the main camp west of Kuybyshevo already existed on 22 June 2014. On 16 July 2014, more parts of the camp are visible in the preview imagery, most notably, the depot near Olkhovskiy, which clearly already existed on that date.
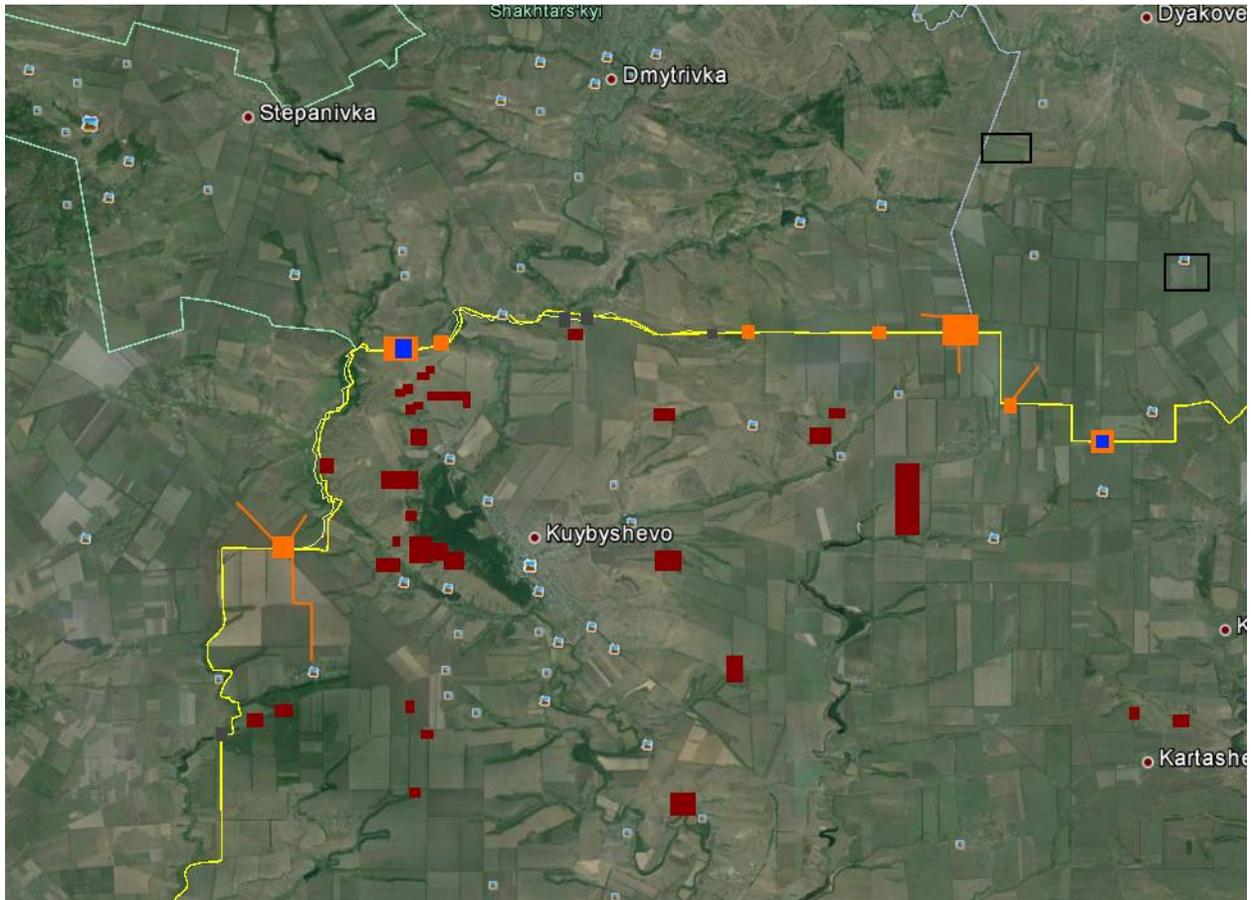
Figure 32: Overview over Zone III, Kuybyshevo: orange: discussed border crossing; orange paths: identified routes connected with the border crossings; gray: other unofficial border crossings in the area not discussed in this report; blue: official border crossing not observed by the OSCE; dark red: temporary Russian military camps; black: areas of Ukrainian camps; sources: Google Earth and author's data

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86   cf.: http://sputniknews.com/russia/20140726/191309461.html (last accessed on 31 July 2015)

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Zone 4: Krasnodarovskiy Area

The Krasnodarovskiy area is southwest of the Kuybyshevo area. The village after which this zone is named is close to the Russian-Ukrainian border and south of the small village of Shramko and the local border crossing. For most of July and August, the Ukrainian side of the border area was under Ukrainian control. In July, a large Ukrainian military camp near Amvrosiivka was the target of one of the first documented cross-border attacks carried out by Russia. The attack on the camp originated from the Krasnodarovskiy area as it is defined here.[87]

This area, however, is most famous for another event in the Russian-Ukrainian war – the battle for Ilovais'k (located 40 kilometers north-northwest of Krasnodarovskiy) and the ensuing deadly retreat under enemy fire was one of the most decisive Ukrainian defeats in a single battle during the summer of 2014. It was already assumed in 2014 that Russian forces participated in the battle. Ukraine had reported on 27 August 2014 that a tactical group of a Russian army battalion had established its headquarters near the Ukrainian village of Pobeda.[88] Two villages go by this name; one is around ten kilometers west of Krasnodarovskiy and the second is 25 kilometers northwest.

Krasnodarovskiy-Pobeda Area

Google Earth satellite imagery from 14 September 2014 shows a border breach northwest of Krasnodarovskiy. This border breach was first reported by Julian Röpcke[89] on 27 January 2015 and later analyzed by the blog Ukraine@war. A later article by Ukraine@war used previously unpublished satellite imagery provided by @finriswolf to further analyze the area and Russia's involvement. (A small Russian base near the border in this area had already been discovered earlier.) For this report, the preceding information will be revisited and enriched by other, not widely known information.[90]

Figure 33 presents the border crossing and the surrounding area. Two major tracks, labeled (a) and (b), cross the border, which is defined by a tree row.[91] The track crossing the border is connected to a Russian military camp (c) in a field. A few tents and trucks are visible in the camp area on 14 September 2014. The traces of a larger camp (d) can be seen south of this position. By 14 September, the camp had already been abandoned, but a comparison between the 16 July and the 14 September imagery reveals new ground structures in the later imagery. Similar ground structures can be found in other Russian military camps close to the border.[92] The area of the camp exceeds what is shown in figure 33. Image (e) presents one of the three identified former artillery positions in the fields south of the track. While the details presented thus far do not show a Russian military presence in the area on 16 July 2014, area (f) documents that there was already a presence on that date. There are vehicle tracks and one vehicle visible on 16 July, the same area still in use on 14 September 2014. There was also a camp in use on 16 July 2014, roughly 700 meters west of Shramko.

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87   cf.: https://www.bellingcat.com/news/uk-and-europe/2015/02/17/origin-of-artillery-attacks/ (last accessed on 25 July 2015)
88   cf.: http://www.rnbo.gov.ua/en/news/1792.html (last accessed on 31 July 2015)
89   cf.: https://twitter.com/JulianRoepcke/status/560210031795515393 (last accessed on 31 July 2015)
90   cf.: http://ukraineatwar.blogspot.co.uk/2015/01/google-earth-shows-how-russians-crossed.html (last accessed on 31 July 2015)
91   Again, the shape of the border depicted on Google Earth is not an exact representation of the border. The course of the border depicted by Yandex is a more accurate representation.
92   See the camp (48.291450, 40.097320) near Donetsk (Russia), for example. On 8 August, some vehicles are still in the area, which may confirm that it was a Russian military camp; however, it seems that the unit left the area soon thereafter. On 22 August, the camp is empty. The structures left near the trees are similar to the ones visible in this area.

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Figure 33: Border crossing between Krasnodarovskiy and Pobeda (47.609565, 38.359922): comparison between 16 July 2014 (left) and 14 September 2014 (right); six areas enlarged for each date; contrast and tone adjusted to ease identification; source: Google Earth

Following the track from the border area, it leads to the northern entry of Kumachove, deep inside Ukraine, where the path crosses a paved road. While there is clearly one prominent main track leading farther westward to a camp north of Kumachove, it is likely that vehicles took different directions from this position. Indeed, there are tracks visible that indicate this. Following the main track farther westward, it splits in the directions of two villages, Shevchenko and Merezhky. Beyond these two villages, it is much more difficult to determine the courses of the paths. The remains of an attacked camp can be identified east of Merezhky.[93] Another destroyed camp can be found southeast of Voikovs'kyi. This latter camp is visible on 16 July imagery and has been identified as a Ukrainian military camp.[94] The craters in both areas point in a southeasterly direction. Tracing the craters' trajectories back to their points of origin, it is possible to identify former artillery positions near Marfinka that may be related to these attacks. This would also indicate that the camp near Merezhky was used by the Ukrainian army, and that this camp was attacked from a position inside Russia. Figure 34 presents the path from the border deeper inside Ukraine and uses a comparison between the 16 July and 14 September 2014 imagery to demonstrate the differences allowing for the identification of the course of the tracks. Other more speculative tracks are also presented as thinner lines.

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93   Not presented; see 47.752278, 38.273805.
94   Not presented; see 47.743946, 38.368104.

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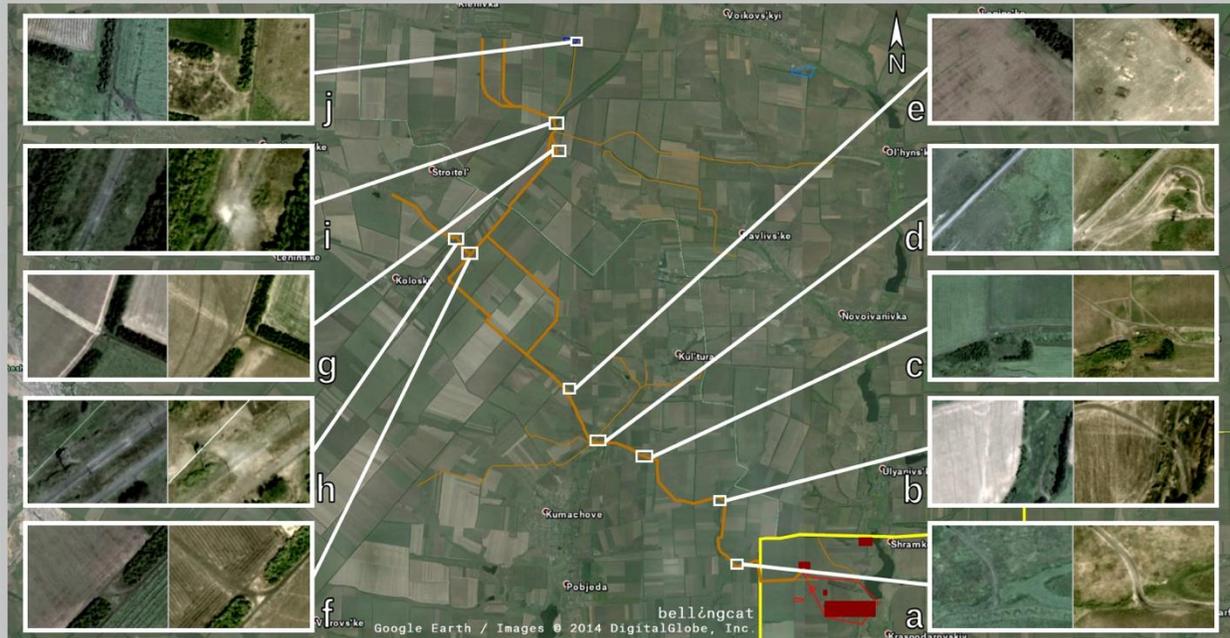
Figure 34: Border crossing between Krasnodarovskiy and Pobeda (47.609565, 38.359922): reconstructed paths inside Ukraine; the small frames present a comparison of ten enlarged areas between 16 July 2014 (left) and 14 September 2014 (right); the main frame presents an overview of the entire area and marks the positions of the presented details; orange paths: identified routes connected with the border crossing; light orange paths: more speculative paths; dark red: temporary Russian military camps; contrast and tone of the details adjusted to ease identification; source: Google Earth

There is a prominent track visible in the fields on the Ukrainian side of the border crossing that leads to the area of Kumachove. It is also possible to identify marks in area (b) that might represent impact craters. Near the camp visible in (e) are tracks leading to tree rows, indicating temporary military camps, and traces of former artillery positions. After the camp, the paths are again clearly visible because of new tracks created in fields. Also noteworthy are (h) and (i), where each of the paths crosses a railway line. The distance between the border and the endpoints of the identified paths is around 18 kilometers.

Because the satellite imagery in Google Earth is from 16 July and 14 September, it cannot be proven with this imagery alone that the border crossing is truly related to the fighting in Ilovais'k. However, it is possible to further narrow down the time of the border crossing using preview imagery from Digital Globe. Figure 35 presents a comparison of the area using the 23 August and 26 August 2014 imagery from this area. Although it seems that the area is empty, it is possible to identify in the 23 August imagery a small, brighter area in the field that matches the position of the Russian military camp along the border. However, there are no visible tracks that lead to the camp area, casting doubt on whether the camp existed on that day. On 26 August, the traces of the camp are clearly visible. Because of the resolution, however, it is difficult to prove that the track between the border and (a) did not exist on 23 August. However, all other parts of the path are clearly visible only in the 26 August imagery. Because the course of the track leads through fields, the path can be easily followed between (b) and (d) in the satellite imagery from 26 August. Furthermore, the non-existence of similar such traces in the fields on 23 August prove that the path did not exist on that date. Deeper inside Ukraine, the more pronounced parts of the tracks are also visible. There can be no doubt that a new track is visible in (f), while the other marked areas are more difficult to assess. The track leading to Merezhky after (i) is also only visible in the 26 August imagery.

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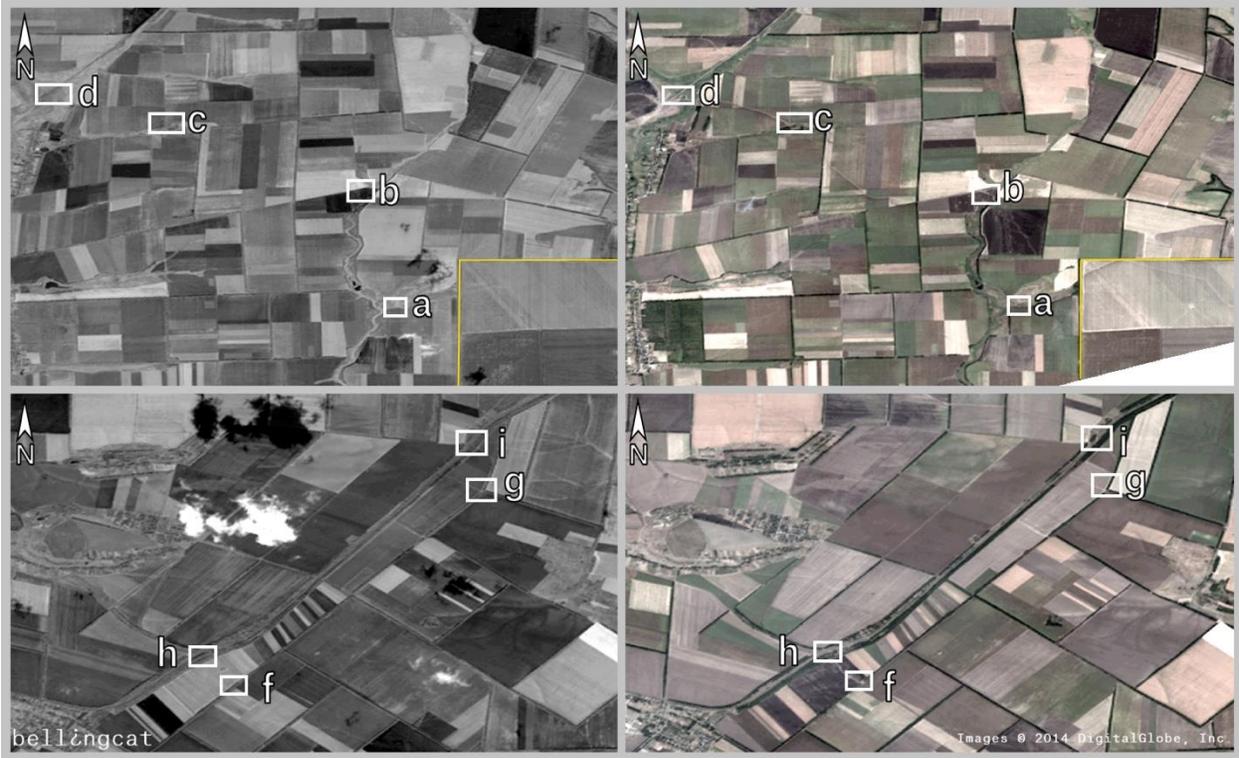
Figure 35: Border crossing between Krasnodarovskiy and Pobeda (47.609565, 38.359922): comparison between 23 August 2014 (left) and 26 August 2014; areas close to the border (top row) and deeper inside Ukraine (second row) are presented; yellow line: course of the border; areas already presented in figure 34 are marked; source: Digital Globe

The Digital Globe preview imagery also shows that the attack on the camp east of Merezhky occurred on or before 23 August 2014, as the impact craters are already visible in the preview imagery for that date. It is not possible to identify similar traces indicating an attack in the preview imagery from 13 August, which suggests[95] that the attack on this position occurred between 13 August and 23 August 2014.[96]

Figure 36: Area north of Kumachove (47.642630, 38.287201): displayed are vehicles moving eastward on a path toward the Ukrainian-Russian border; reproduction of the image presented by Ukraine@war using unreleased imagery provided by @finriswolf with publicly available preview imagery from 3 September 2014; two areas enlarged; contrast and tone adjusted to ease identification; sources: Google Earth (background), preview imagery from TerraServer (3 September 2014 imagery)

95   The resolution of the 13 August imagery is quite low; therefore, it might be possible that existing craters are not visible in this imagery. However, the clearly visible traces of the attack derived from the 23 August imagery suggest that at least some traces should also be visible in the 13 August imagery.
96   Satellite imagery not presented in this report.

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TerraServer's imagery allows for the verification of the imagery provided by @finriswolf, which depicts the situation north of Kumachove on 3 September 2014. Using TerraServer imagery, figure 36 presents a reproduction of the figure already published by Ukraine@war.[97] The imagery further documents the already established connection between the camps inside Russia and the camps inside Ukraine close to the track crossing the border. More than 25 vehicles are visible, almost all of which are headed eastward on the track leading to the border. Two vehicles seem to block the road north Kumachove. The dust cloud caused by the vehicles is also recognizable in the Digital Globe preview, further legitimating the imagery.

The 3 September TerraServer imagery from the area provides further evidence. A large convoy of military vehicles is visible near the village of Burne. The convoy consists of two columns, both of which are heading east. Burne is close to the areas marked (f) and (h) in figure 34, and the track seen in the imagery could be connected with the border-crossing track between Krasnodarovskiy and Pobeda. The western column of the convoy is presented in figure 37 crossing the railroad line at (h). More than 40 vehicles are visible in the displayed area. The complete convoy encompasses more than 80 military vehicles and includes towed artillery, armored vehicles, and what are most likely tanks. Because the track leading to Burne was also visible in the Digital Globe imagery from 26 August 2014, this convoy did not create the track.

Figure 37: Military convoy heading east near Burne (47.698833, 38.226780) on 3 September 2014: two areas are enlarged; the right area is almost identical to area (h) in figure 34; contrast and tone adjusted to ease identification; source: preview imagery from TerraServer

Additional groups of vehicles could be identified in two other areas. Eight vehicles are positioned in a camp north of Kumachove,[98] and six vehicles can be seen in an area south of the same camp.[99] The eight vehicles demonstrate that the camp was used by the Russian military, which used the border-crossing track. In total, at least 120 military vehicles are visible on 3 September in the area. Most of them are heading eastward toward the Ukrainian-

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97   cf.: http://ukraineatwar.blogspot.nl/2015/04/defeating-ukrainian-volunteer.html (last accessed on 31 July 2015)
98   Not presented; see 47.662376, 38.265210
99   Not presented; see 47.644583, 38.256786

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Russian border. Other TerraServer satellite imagery from 3 September 2014 shows the situation farther west in Novodvirs'ke,[100] where another convoy of around 30 vehicles can be seen heading in the direction of Mospyne, deeper into Ukraine.

Aside from the visual evidence provided by satellite imagery, other information is available for this area that clearly documents the connection between Russia's armed forces and the military units that crossed the border. Three reports from the end of August are especially noteworthy in this regard. First, on 25 August 2014, Ukraine captured 10 Russian paratroopers near the village of Dzerkalne.[101] Dzerkalne is 4.5 kilometers north of Merezhky, one of the endpoints of the track connected with the border crossing. Second, Reuters published a report describing the situation in the small village of Kolosky on 26 August 2014. Kolosky is just two kilometers southwest of Burne, the village where the path leading to the west crossed the railroad line and where the 80-vehicle convoy is visible on 3 September 2014. The Reuters journalist interviewed two witnesses in the village who reported that, over the weekend,[102] dozens of soldiers had appeared in the area. The article goes on to say that the soldiers were of similar appearance and behavior to the Russian soldiers that had occupied Crimea in February and March 2014. The soldiers did not wear any insignia, but were instead marked by white armbands also worn by the Russian soldiers captured north of the village on 25 August 2014. While the identification marks on the vehicles were painted over, all of the vehicles were reportedly marked with white circles.[103] Third, another Reuters report released on 28 August 2014 covered the sighting of military vehicles close to the border in Russia. North of Krasnodarovskiy, close to a medical first aid tent, a column of military vehicles coming from the border area was photographed by a Reuters' journalist. One soldier was seemingly wounded and one vehicle was damaged. The soldiers seen by Reuters inside Russia were marked by white armbands, and the photographed vehicles also had a white circle identification mark like that which was reported in the earlier Reuters article. The Reuters journalist, however, was not able to get confirmation from the soldiers that they were members of Russia's armed forces.[104]

Figure 38. Reuters images from Krasnodarovskiy (right) and geolocation of the images (left): the likely photographer position (47.599124 38.402342) is marked; prominent features are marked on both sides; some part are enlarged to ease identification; Google Earth satellite imagery from 20 June 2012 and 14 September 2014 used; sources: Reuters (right images), Google Earth (left)

100   Not presented; see 47.841164, 38.148560
101   cf.: http://www.telegraph.co.uk/news/worldnews/europe/ukraine/11056312/Russian-paratroopers-captured-in-Ukraine-accidentally-crossed-border.html (last accessed on 31 July 2015)
102   23 August and 24 August 2014
103   cf.: http://www.reuters.com/article/2014/08/26/us-ukraine-crisis-fighters-idUSKBN0GQ1X520140826 (last accessed on 31 July 2015)
104   cf.: http://in.reuters.com/article/2014/08/28/ukraine-crisis-russia-column-idINKBN0GS16920140828 (last accessed on 31 July 2015)

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Two photographs from that report and the geolocation confirming their location are presented in figure 38. The photographs were taken from a position north of Krasnodarovskiy, close to the track leading to the border crossing and the Russian camp in the field. The 14 September 2014 satellite imagery also shows a truck driving toward the border area on the same road as well as a small military camp, indicated by a tent, footpaths, and military vehicles south of the photographer's position, but still north of Krasnodarovskiy.[105]

In addition to these reports, Russian soldiers stationed in the area uploaded photographs they had taken to their social media accounts. This imagery can be considered authentic, as nearly all of the subsequent imagery had already been uploaded in September 2014. Vladimir Dey,[106] most likely a Russian military doctor, uploaded a photograph showing him in front of a container marked with a red cross and a geotag pointing to an area north of Krasnodarovskiy. The position of the geotag is close to the small Russian camp north of Krasnodarovskiy mentioned above. While the image was uploaded on 27 October 2014, it was most likely taken earlier, because he uploaded other images with a different geotag on the same day. Nonetheless, this image indicates that this specific Russian camp might have been a first aid medical station, which would correspond with the Reuters report from the area, which mentioned a medical tent.

Another Russian soldier, Slavik Sitnikov, provided a detailed look at the Russian camp in the field northwest of Krasnodarovskiy, near the Russian-Ukrainian border. He uploaded images geotagged in the area in September 2014; some of the uploaded images can be easily geolocated by comparing the camp layout visible in his images with the layout of the camp visible in Google Earth's satellite imagery. Figure A5 in the appendix depicts an example of this using one of the photographs offering the best view of the camp. Other photographs uploaded to his profile[107] document that he was a Russian soldier in 2014. One of the images he uploaded is especially noteworthy in that it shows a military truck with a worn-out red cross emblem and no license plate as well as Kamaz trucks parked close to the camp with clearly marked white circles.

Slavik Sitnikov was not the only Russian soldier to upload images of Russian military vehicles marked with a white circle in the area. Figure 39 presents a collection of such photographs. The photographs show military trucks, armored military vehicles, and tanks with geotags pointing to three different areas. The photograph uploaded by Nazar Nazarov shows a truck marked with a white circle and a license plate. Although the numbers are not quite visible, it can still be discerned that it is a Russian military plate. Figure A6 in the appendix presents the geotag of the tanks and TerraServer satellite imagery from the same area, confirming the existence of a camp in the area. The photograph showing Russian tanks with white circles is not only interesting because of the white circle itself. The image also plays a part in the discussion of whether Russian tanks, in particular the modern T-72B(3) variant only used by Russia, were used in the battle of Ilovais'k. Along with the images showing T-72B variants with the white circle inside Russia, there is also imagery showing a destroyed and captured T-72B(3) near Ilovais'k. Because the B3 variant is only used by Russia, it further strengthens the already powerful evidence that the Russian military participated in the battle of Ilovais'k.[108]

105 Not presented; see 47.594314, 38.401286
106 cf.: https://archive.is/pe4uy, https://archive.is/fUT4D and https://archive.is/lR84r (last accessed on 31 July 2015)
107 https://archive.is/ZNpha (last accessed on 31 July 2015)
108 cf.: http://www.martenscentre.eu/publications/caught-act-proof-russian-military-intervention-ukraine,

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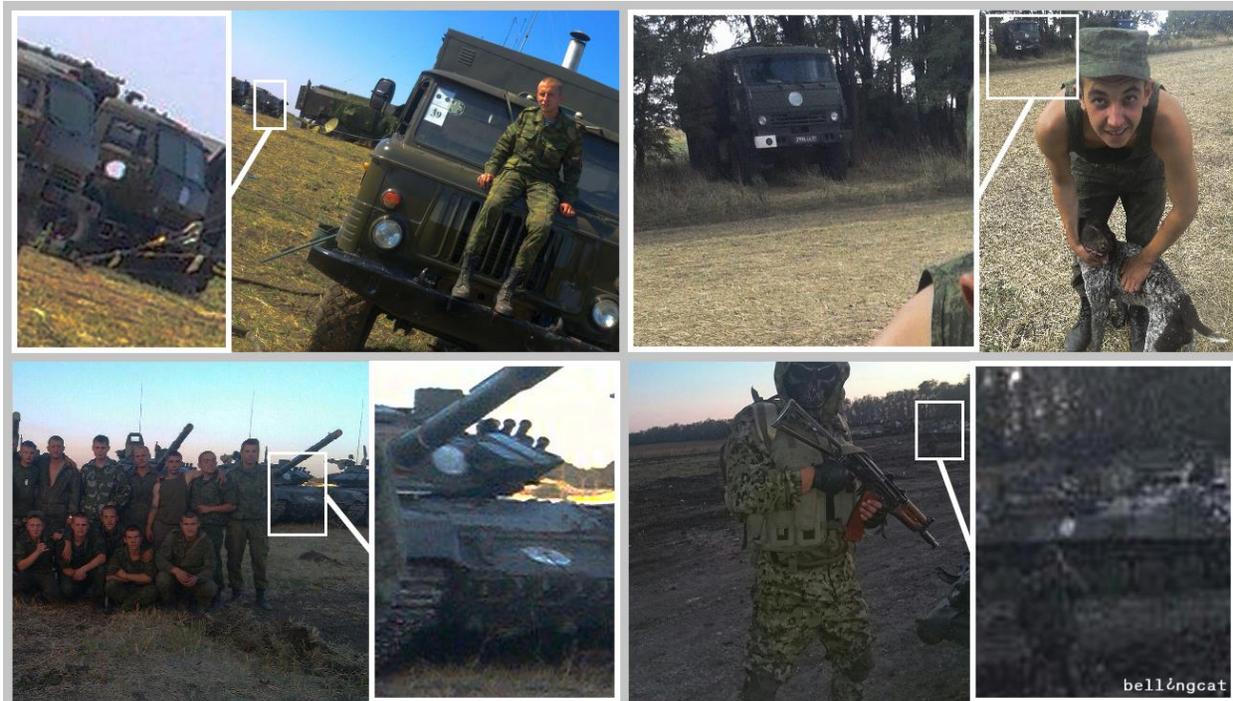
Figure 39: Military vehicles with a white circle in Russia: top left: Slavik Sitnikov (https://archive.is/ZNpha), image uploaded on 13 September 2014 (https://archive.is/SLJNz); other pictures uploaded by him are geotagged near a Russian camp (see figure A5 in the appendix, 47.609142 38.368502); top right: Nazar Nazarov (https://archive.is/YH997), image uploaded on 16 September 2014 (https://archive.is/mHnp4), with geotag (47.568963 38.389637); bottom left and right: Andrey Golovyashkin (https://archive.is/ZjgKY), left image uploaded on 29 September 2014 (https://archive.is/otCPf), with geotag (47.545143 38.502212), right image uploaded on 29 September 2014, without geotag; sources: VK, archive.is

Further Information Regarding the Krasnodarovskiy Area

There are three other instances of border crossings (in addition to the official Shramko border crossing) in the Krasnodarovskiy area. All four areas are presented in figure 40. The earliest border crossing took place northeast of Krasnodarovskiy, west of Seleznev. Scorch marks typical of MLRSs are visible inside Ukraine close to the border on 16 July 2014. The marks point in direction of a Ukrainian field camp near Amvrosiivka. This attack is likely closely related to an attack from Russia that had the same target. The track crossing the border is very difficult to identify in this case. The path follows the eastern tree row and then crosses the southern border.

A second border crossing can be found northwest of Krasnodarovskiy, north of the Russian camp in the field near the major border crossing discussed in the preceding subsection. The course of the border in the area is identical to the tree row. A path coming from the southeast leads to the tree row and into the trees. On the other side of border, inside Ukraine, a path heading northeast leaves the tree row. Around two kilometers east of this area is the Shramko border crossing. On 16 July 2014, the road on the Ukrainian side of the border crossing was blocked with obstacles. These obstacles were no longer blocking the road by 14 September 2014; both obstacles were moved in the meantime and the road was clear. However, there is no additional visual evidence attesting to usage of this border crossing.

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http://www.reuters.com/article/2014/10/23/us-ukraine-crisis-tanks-exclusive-idUSKCN0IC1GE20141023 (last accessed on 31 July 2015) and
http://sled-vzayt.livejournal.com/3827.html (last accessed on 19 September 2015)
The last source also provides additional information for Russian soldiers posing in front or on a T-72B(3) marked with white circles.

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Figure 40: Other areas with border crossings in the Krasnodarovskiy area: far left: border crossing northeast of Krasnodarovskiy, comparison between 20 June 2012 (top) and 16 July 2014 (bottom); left: border crossing northwest of Krasnodarovskiy, comparison between 16 July (top) and 14 September 2014; right: Shramko border crossing, comparison between 16 July (top) and 14 September 2014; far right: border crossing east of Hlynka (47.544770 38.304199), comparison between 14-19 September 2014 (top) and 3 October 2014 (bottom); note: the exact date of the far top right imagery could not be established, but it could be determined that the date of the imagery must be between 14 and 19 September 2014; sources: Yandex (far left bottom, top right, and far top right), preview imagery from TerraServer (far bottom right), Google Earth (all other imagery)

The last border crossing is located south of the area discussed and lies west of Hlynka. Yandex imagery from September does not show a border crossing in the area. However, 12 self-propelled artillery units (most likely Msta-S) and six pieces of towed artillery are visible in the region south of the presented area. The field also shows the typical signs of former artillery positions, thus documenting a Russian military presence in the area. On 3 October 2014, a track can be seen crossing the border in the satellite imagery from the area. On the other side of the border, the track heads to the north and then in a westerly direction.

The summary for the Krasnodarovskiy area is presented in figure 41. Compared to zones 1 through 3 discussed earlier in this report, the number of identified border crossings and military camps is relatively low. That being said, border crossings in this zone can be clearly associated with the battle for Ilovais'k, which resulted in one of the most decisive Ukrainian defeats in a single battle in the summer of 2014. In the eastern part of the area, an active role played by Russian troops is documented as early as July.[109] At least two attacks originated from the area before or on 16 July 2014. One attack was launched from inside Russia while another attack was launched from inside Ukraine after the crossing the border. The area around Seleznev, as depicted in the 14 September satellite imagery, shows many more signs of outgoing fire, particularly traces of former artillery positions. Artillery attacks originating from this area were also reported by Ukraine.[110] Other evidence of the Russian military's presence in the area around that time is provided by individual soldiers. Danil Khizhnyak,[111] for

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109 It is possible to document an even earlier Russian military presence in the Krasnodarovskiy area as early as June 2014. Russian soldiers uploaded images with a geotag in the area at the end of June 2014.
110 See e.g.: http://www.rnbo.gov.ua/en/news/1785.html (last accessed on 1 August 2015)
111 https://archive.is/NgKjj (last accessed on 1 August 2015)

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instance, uploaded photographs in August geotagged in the Seleznev area[112] that strongly suggest that he was stationed in the area. It is especially noteworthy that he is member of an artillery unit, as documented by other photographs on his VK account. In the second half of August, Ukrainian officials reported attacks on positions and units guarding the border and the area south of Ilovais'k.[113] Also in the second half of August, a large Russian military formation entered Ukraine in the area and moved deep into Ukraine. Some of the units participating in this campaign seem to have left the area on 3 September 2014.
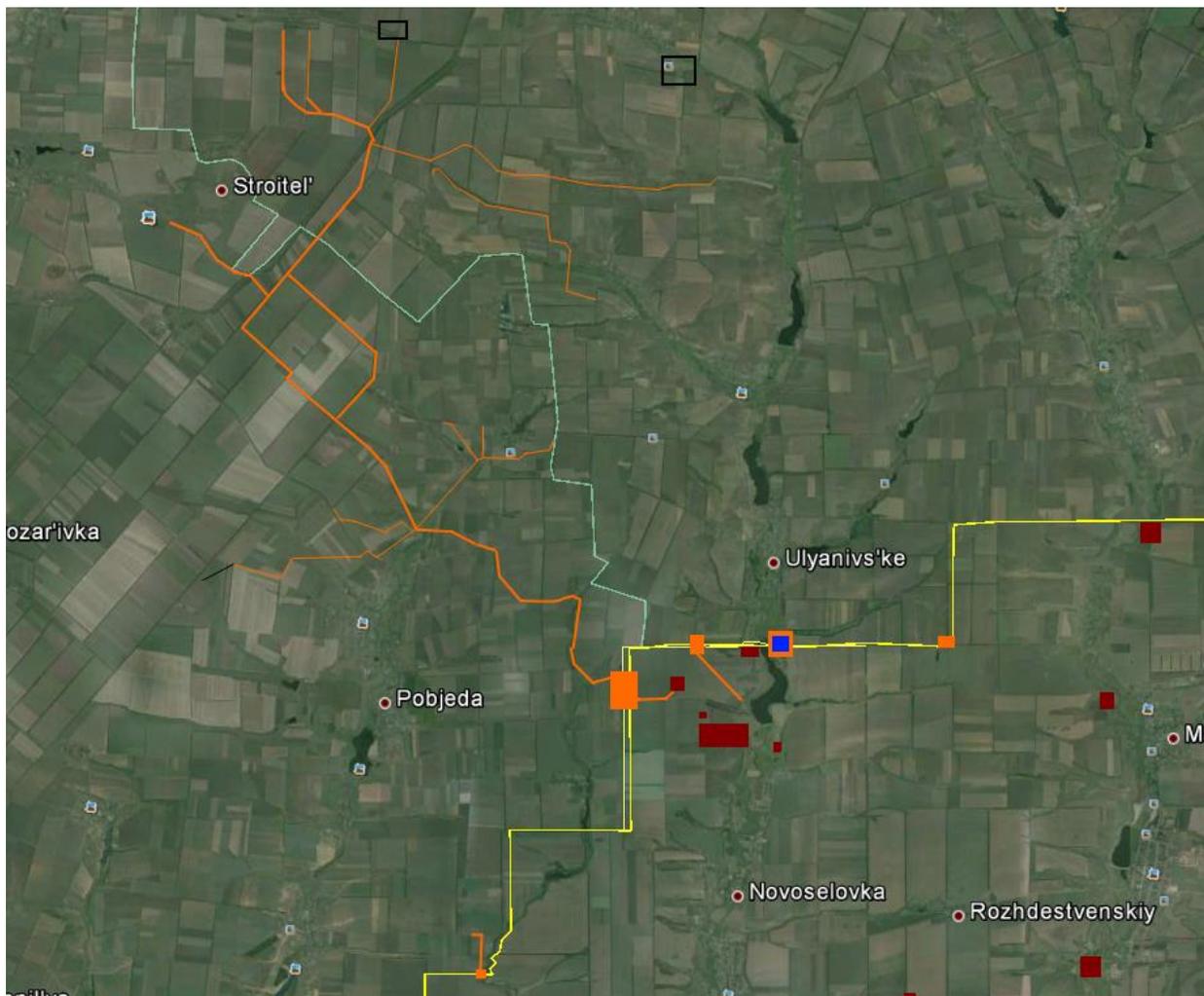
Figure 41: Overview of Zone IV, Krasnodarovskiy: orange: border crossings; orange paths: identified routes connected with the border crossings; blue: official border crossing not observed by the OSCE; dark red: temporary Russian military camps; black: areas of Ukrainian camps; sources: Google Earth and author's data

112   https://archive.is/kWDJR and https://archive.is/KZW4j (last accessed on 1 August 2015)
113   cf.: http://www.rnbo.gov.ua/en/news/1787.html and http://www.rnbo.gov.ua/en/news/1789.html (last accessed on 1 August 2015)

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Zone 5: Maksimov Area

The last area examined in this report is the Ukrainian-Russian border east of Mariupol. Maksimov, the village after which this zone is named, is close to the official border crossing in the area connecting Novoazovsk, Ukraine and Veselo-Voznesenka, Russia. After the events in Mariupol in the early phases of the conflict, the entire region was relatively stable, and the Ukrainian side of the border was under Ukrainian control.

Even after the fighting escalated in the northern part of the Ukrainian Donetsk region, the situation remained calm in the region east of Mariupol for all of July and the first two thirds of August. However, at the end of August, the situation dramatically deteriorated, and the area became one of the hot spots of the war. Over the course of the fighting, Ukraine lost control of the entire border area, which, as of this writing, is controlled by Russian troops inside Ukraine.

Because there was no obvious connection between the Russian-held territory in the northern part of the Donetsk region and the region east of Mariupol, there were claims as early as August 2014 that the attacking forces must have come from Russia. Indeed, Ukrainian officials, in their daily reports of the situation on the ground, claimed that Russian troops crossed the border and were engaging in hostilities.[114]

Examining the area comprising this zone is more complicated than the preceding four, because the amount of relevant satellite imagery is quite limited. Google Earth's imagery is from 2013, and Bing's and TerraServer's imagery are from October 2014, quite some time following the events that took place at the end of August 2014. The Digital Globe database has no imagery for July and August 2014 from this area; the first available imagery for the second half of 2014 is dated 13 September 2014. Yandex has relevant imagery showing traces of hostilities. Because it lacks elements visible in the 3 October TerraServer imagery, the imagery must have been captured before that date.

Figure 42 presents details of the Yandex imagery and compares them with Digital Globe preview imagery. On the left is the cemetery of Novoazovsk. The burnt area is visible in both images. It is also known that the attack that led to the fire in the cemetery occurred on 26 August 2014.[115] This alone proves that the Yandex imagery shows the area on or after 26 August 2014. The rest of figure 42 compares fields in the area. The field presented in the middle is partly plowed in the Yandex imagery; it is even possible to identify vehicles working on the field. The Digital Globe preview imagery from 13 September shows a much more plowed field. The area where the field is already worked in both images shows the same structure and brightness differences between the individual rows. The field presented in the images on the right is burning in the northern part of the displayed area in the Yandex imagery. The 13 September 2014 preview from Digital Globe shows a different scene. The shape of the burned field in the Yandex imagery has changed, indicating that larger parts of the field were affected by the fire. Therefore, the imagery presented in the middle and the right of the figure document that the Yandex imagery shows the area before or on 13 September 2014.

114   cf.: http://uacrisis.org/8463-nsdc-10 and http://www.businessinsider.com/top-ukrainian-official-a-column-of-russian-tanks-have-entered-southeastern-ukraine-2014-8?IR=T (last accessed on 1 August 2015)
115   See the image, "Shelling of Novoazovsk [on August 26] set on fire the cemetery in the western part of the town near Mariupol highway" by Petr Shelomovskiy. cf.: http://www.interpretermag.com/ukraine-liveblog-day-191-fighting-in-ilovaisk-amvrosievka-and-novoazovsk/ (last accessed on 2 August 2015)

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Figure 42: Determination of the date of the Yandex imagery; comparison of Yandex (top) and Digital Globe preview imagery (bottom); left: Novoazovsk cemetery (47.125919, 38.066707), middle: field west of Markyne (47.190810, 38.168019), right: field south of Maksimov (47.141123, 38.283703); Digital Globe preview imagery either from 21 September 2014 (left) or 13 September 2014 (middle and right); sources: Yandex (top row), Digital Globe (bottom row)

Novoazovsk – Veselo-Voznesenka Border Crossing

In the Maksimov area, the Novoazovsk - Veselo-Voznesenka border crossing is one possible place for cross-border traffic. Because of the paved roads, the visual evidence for the transport of military personnel and materiel via a border crossing will again be minimal. Even so, it was nonetheless possible to identify traces that suggest such usage. In 2013 (not presented), the border crossing does not show anything of particular note. The 2014 Yandex imagery of the border crossing (presented in figure 43) shows obstacles on the Ukrainian side of the border. Instead of forming a closed line, a track between the obstacles is visible. The border crossing and the surrounding terrain also shows evidence of prior attacks. In the field south of the border crossing small craters are visible, and the roofs of the buildings are damaged. However, an area east of the border crossing contains a more interesting detail.

East of the tree row marking the border in this area is a track that connects Maksimov and the border crossing. A similar track is not visible in the 2013 imagery. The track leads to a road on the Russian side of the border crossing. Instead of staying on their side of the road, the traces from the vehicles cover nearly the entire road, indicating an unusual kind of traffic. The same track is visible in the 3 October 2014 imagery in a more pronounced manner, making the details easier to identify. The higher resolution and different lighting conditions reveal not only that the track was used between the two images but also more traces of dirt on the road in the October imagery. Usage of the border crossing by the Russian military is also indicated by a report of Ukrainian officials in August 2014.[116]

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116   cf.: http://uacrisis.org/8463-nsdc-10 (last accessed on 2 August 2015)

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Figure 43: Maksimov border crossing (47.159778, 38.235415): comparison between 26 August – 13 September (left) and 3 October 2014 (right); two details enlarged; contrast and tone adjusted to ease identification; yellow: course of border in Yandex; sources Yandex (left), preview imagery from TerraServer (right)

Border crossings also took place at a second area west of Maksimov. These tracks over the border were first presented by @finriswolf using previously unpublished satellite imagery from the area.[117] It is possible to verify @finriswolf's imagery using now publicly available satellite imagery. The border crossings are not visible in the 2013 Google Earth imagery or Yandex's imagery taken sometime between 26 August and 13 September 2014. This demonstrates that both crossings had not been created before mid-September 2014. However, both tracks crossing the border are clearly visible in the 3 and 13 October imagery from Digital Globe via TerraServer and Bing.[118] The more pronounced southern border crossing connects a road in Maksimov with old farm buildings in Ukraine 1.3 kilometers east of the border. The second, less pronounced border crossing is around 200 meters north of the southern track. It seems that the path splits in Russia into a northern and a southern track. The southern track clearly crosses the border, while the visual evidence indicating that the northern track also crosses the border is lower. This area and the border crossings therein are presented in figure 44. For the southern track, Yandex and TerraServer imagery is compared; for the northern track, only TerraServer imagery is presented.

While there are tracks leading over the border, there is less visual evidence of nearby Russian troops thus far. The satellite imagery only covers a small part of the Russian hinterland in this part of the border. Major Russian military camps have not been identified so far in the visible area. The closest known Russian military installations are bases in Taganrog and temporary military camps in the Malokirsanovka[119] and Derkacheva areas.[120] The distance between Maksimov and these installations is around 40 kilometers. It is also possible to find visual evidence that might indicate a Russian military camps or positions three kilometers east of Maksimov.[121]

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117   cf.: https://twitter.com/finriswolf/status/580151261590200321 and
      https://twitter.com/finriswolf/status/580158545657606145 (last accessed on 2 August 2015)
118   It is possible to interpret the 13/17 September preview imagery from Digital Globe in such a way that the track in question already existed on those dates; however, the image resolution is too low to yield a definitive conclusion.
119   Not presented; see 47.473368, 38.601035 and 47.496699, 38.513151 (in Yandex)
120   Not presented; see 47.492073, 38.351288 (in Yandex)
121   Not presented; see 47.176700, 38.299497 (in Yandex)

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Figure 44: Border crossings west of Maksimov (left and middle, 47.165270, 38.236056): comparison between 26 August – 13 September (left) and 3 October 2014 (middle), right (47.167003, 38.236246); situation on 3 October 2014; yellow: course of border in Yandex; sources: Yandex (left), preview imagery from TerraServer (middle and right)

The best-documented Russian presence in the area is in the village of Maksimov. The visual evidence in the satellite imagery is again quite limited, as only a position with a few fortifications close to the border is visible. But it was possible to identify Russian soldiers who uploaded geotagged photographs near the village. Some photographs documenting the presence of Russian soldiers in the area were uploaded onto the VK account of Svetlana Rombaeva, likely the wife or girlfriend of the soldier visible in the photographs. The images were uploaded between 3 July and 20 July. Two pictures, both uploaded on 7 July 2014, are geotagged in an area west of Maksimov where the fortification can be seen on satellite imagery. One of the images could be geolocated – see figure 45 for a comparison between the image and satellite imagery from the area.

Figure 45: Svetlana Rombaeva; geolocation of uploaded image: the image was uploaded on the VK account on 7 July 2014 (https://archive.is/kcmfF); the right image presents the same area (47.165403, 38.240579) in satellite imagery from TerraServer on 3 October 2014; sources: VK, preview imagery from TerraServer

The area of the geolocated photograph is striking. A just meter north of the position is one of the tracks that cross the border west of Maksimov. From that position, a track leads to the south into a tree row. On the other side of the tree row are the tracks that lead to the Novoazovsk – Veselo-Voznesenka border crossing. Other photographs geotagged in Maksimov were uploaded by Vitaly Podolyak to his VK account.[122] The first was uploaded on 5 September, the other two images on 4 October 2014.[123] All three photographs are geotagged at the exact same location – a farm area northeast of Maksimov.[124] Containers

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122 https://archive.is/GZ9uw. Note that this solider has also uploaded one image to his account with a geotag pointing to the small field camp north of Krasnodarovskiy; see https://archive.is/oy02g (last accessed on 2 August 2015)
123 https://archive.is/vHoQo, https://archive.is/UHera and https://archive.is/0Zfbc (last accessed on 2 August 2015)
124 Not presented; see 47.170667, 38.265923

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marked with a red cross can be seen in the photographs uploaded to his account, suggesting that the camp northeast of Maksimov was a first aid medical station. It is also possible to identify the prominent water tower in the image uploaded on 5 September 2014 in the area near the farm.

Shcherbak Area

The second area with an identified border crossing is east of Shcherbak, a small Ukrainian village six kilometers north of the Novoazovsk – Veselo-Voznesenka border crossing. The position of this border crossing was also first presented by @finriswolf previously unreleased satellite imagery from October 2014 from the area.[125] It is now possible to verify this border crossing with the available satellite imagery, which is presented in figure 46.

Figure 46: Border crossing southeast of Shcherbak (47.201638 38.235937): comparison of 25 October 2013 (left), 26 August – 13 September (middle), and 3 October 2014 (right); the area of the border crossing is presented with adjusted contrast and tone to ease identification; sources: Google Earth (left), Yandex (middle), preview imagery from TerraServer (right)

The border crossing is not visible in the available Google Earth imagery from October 2013. The Yandex imagery, which dates to sometime during the period between 26 August and 13 September, shows the border crossing and demonstrates that the track crossing the border had already existed in September 2014. The TerraServer imagery from 3 October 2014 shows a more pronounced path crossing the border. The available imagery not only demonstrates that there was a track crossing the border in the area; the Yandex imagery also allows a more exact assessment of when the track was first used. It is also possible to state that the tracks must have been used between the dates of Yandex and the TerraServer imagery. New tracks visible in later imagery appear along the course of the track inside Ukraine.

While the track's origin in Russia cannot be clearly determined, it is possible to follow the path inside Ukraine. The track leads to a tree row north of the border crossing and from there to a small farm east of Shcherbak. From the farm a more established, most likely paved, road leads westwards to the village.[126] It is also possible to find reports of a border crossing by Russian troops in the area around Shcherbak. More specifically, one of the first appearances of Russian troops east of Mariupol in August 2014 was reported in this area and might be connected with the presented border crossing. On 25 August, there were reports that a column consisting of 10 tanks, two armored vehicles, and two trucks crossed the Russian-

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125   cf.: https://twitter.com/finriswolf/status/580176383827017728 (last accessed on 1 August 2015)
126   A crossroad (47.21675, 38.215599) close to the eastern entry of Shcherbak shows signs of heavy traffic, although it is not possible to determine if the visible traces are connected with the border crossing.

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Ukrainian border and entered Ukraine near Shcherbak.[127] Furthermore, the Ukrainian situation report from 27 August states that control over a number of villages in the area was lost, including Shcherbak and the neighboring villages of Markyne, Kovske, Sedovo-Vasylivka, Kuznetsy, and Rosy Luxemburg.[128] This indicates that Russia's August offensive east of Mariupol might have originated in the Shcherbak area.

Further Information Regarding the Maksimov Area

Besides the two described areas where cross-border traffic occurred, there is little visual evidence documenting Russian attacks on Ukraine from within Russia or cross-border troop movements.[129] Two other places, however, could be relevant and shall be therefore briefly considered. Both are south of the Novoazovsk – Veselo-Voznesenka border crossing. It is possible to identify another track that crosses the border in this area. The path is already visible in Yandex's 26 August to 13 September imagery and later Digital Globe imagery. The modest visibility of the track indicates that this path might have only been slightly used. The second area is inside Russia, around two kilometers south of the border crossing. Yandex imagery from the area shows a small path in a field, which features a bright area. The bright area's visual appearance is similar to the two alleged mortar positions in the Dolzhanskyi area.

Figure 47: Border crossing (left and middle, 47.127753, 38.229484) and likely mortar position in Russia (right, 47.141012 38.242545):, both south of the Novoazovsk - Veselo-Voznesenka border crossing; left and middle: comparison between 26 August – 13 September (left) and 3 October 2014 (middle); right: situation visible in the 26 August – 13 September Yandex imagery; the area of the border crossing enlarged; contrast and tone adjusted to ease identification; sources: Yandex (left and right), preview imagery from TerraServer (middle)

The border crossing is barely visible in the Yandex imagery from late August to early September. The path is more pronounced in the Digital Globe imagery from October, but the visibility of the path is still quite low. While it is also difficult to assess the origin and target area of the path, there are visible traces in the fields allowing for a determination of part of its course. In Russia, it seem that the track leads eastward through a field to a tree row. In Ukraine, parts of the track are visible in the 13 October Digital Globe imagery available in Bing. The track leads northward at first and then turns afterward westward to an existing dirt road.

The summary for Maksimov is presented in figure 48. The visual evidence documenting a Russian military build-up in the area is quite low. However, Russian soldiers disclosed their

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127   cf.: http://www.businessinsider.com/top-ukrainian-official-a-column-of-russian-tanks-have-entered-southeastern-ukraine-2014-8?IR=T (last accessed on 2 August 2015)

128   cf.: http://www.rnbo.gov.ua/en/news/1792.html (last accessed on 31 July 2015)

129   There is video evidence documenting an MRLS attack from inside Russia in this area. For details, see: http://ukraineatwar.blogspot.dk/2014/08/russia-shelling-ukrainian-village-from.html (last accessed on: 11 September 2015). However, the launch area could not be identified in the available satellite imagery thus far.

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own presence in the area with photographs uploaded to their social media accounts. Geotagged photographs point to the small village of Maksimov. The satellite imagery also shows a fortified position in the area, corroborating the geotags. Two areas with cross-border traffic are directly linked to Maksimov; tracks can be seen west of the village leading between Russia and Ukraine, and a track south of the village leads to the Novoazovsk – Veselo-Voznesenka border crossing before turning toward Ukraine via a paved road. Another track crossing the border could be identified east of Shcherbak. This visible evidence suggests that this track was used multiple times. Some of the tracks closely correspond with reported cross-border traffic in the area.
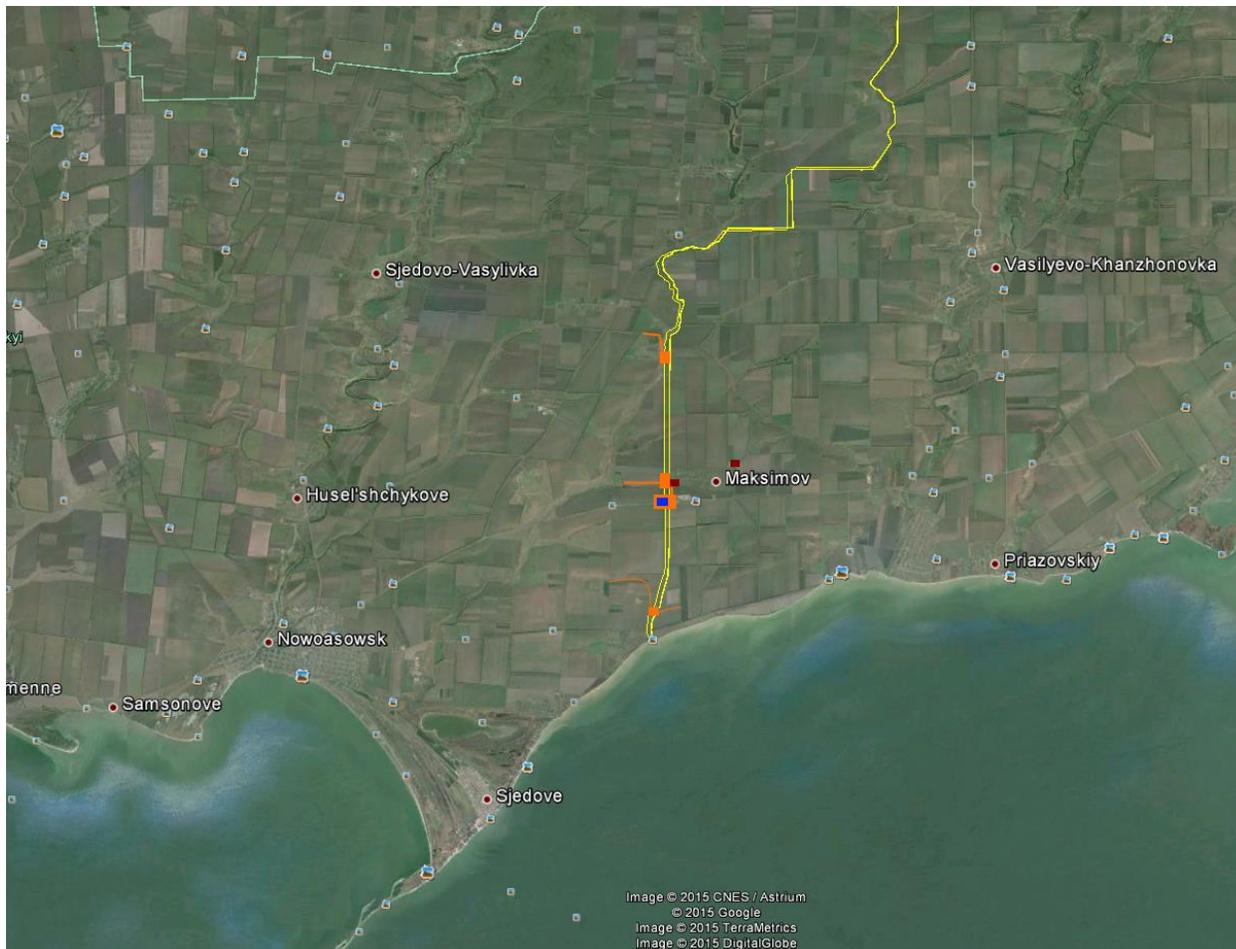

Figure 48: Overview of Zone V, Maksimov: orange: discussed border crossings; orange paths: identified routes connected with the border crossings; blue: official border crossing not observed by the OSCE; dark red: temporary Russian military camps; sources: Google Earth and author's data

Beside direct visual evidence via satellite imagery, there are various reports from the area further indicating Russia's involvement. Journalists in the area did not see a Russian presence inside Ukraine in the area or even close to the area before the events toward the end of August, when Ukrainian positions in the area were shelled. Craters from these attacks point toward the northeast in the direction of the Ukrainian-Russian border.[130] The Russian troops that

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130   cf.: http://www.reuters.com/article/2014/08/26/us-ukraine-crisis-novoazovsk-exclusive-idUSKBN0GQ19U20140826 (last accessed on 2 August 2015)

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subsequently appeared in the region were marked by white stripes,[131] the same marking seen on Russian troops in the Krasnodarovskiy area. Furthermore, the equipment used implies direct Russian involvement. For instance, because of its unique markings, a Msta-S self-propelled howitzer that was first seen inside Russia was later positively identified inside Ukraine in Novoazovsk.[132] As was seen in the Krasnodarovskiy area, Russian vehicles filmed by Al Jazeera inside Ukraine were also marked with a white circle.[133]

131 cf.: http://kommersant.ru/doc/2554211, an English translation of the article was provided by The Interpreter: http://www.interpretermag.com/ukraine-liveblog-day-191-fighting-in-ilovaisk-amvrosievka-and-novoazovsk/ (last accessed on 2 August 2015)
132 cf.: https://www.bellingcat.com/resources/case-studies/2015/05/29/confirming-the-location-of-the-same-msta-s-in-russia-and-ukraine/ (last accessed on 25 July 2015)
133 cf.: https://www.youtube.com/watch?v=ocfxP-lerAY (last accessed on 2 August 2015)

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Border Crossings and the Course of the War

The preceding section of the report presented the available evidence for cross-border traffic in five defined regions. The following section provides a brief assessment of these findings, wherein the identified border crossings will be discussed in relation to the timeline of the conflict. The scope of the section is only to embed the identified border crossings in a wider context of the war, not to discuss Russia's participation in the war in full detail.

As early as June and early July 2014, there were indications of cross-border traffic. This is implied by heavy weaponry filmed in towns near the border and the border crossings identified above. In particular, there were sightings of columns with tanks in Torez, Snizhne, and Krasnodon. All three towns are close to the Ukrainian-Russian border.[134] Additional evidence was found after the fighting in Slavyansk, when Ukraine discovered a weapons cache including MRO-A disposable incendiary rocket launchers, a weapon not known to be exported outside of Russia.[135]

July through the Middle of August

In July 2014, hostilities became fiercer than any time before. While Ukraine regained control over some areas in northern parts of the Donetsk region, the Ukrainian troops guarding the border area in the Luhansk region came under heavy fire. These attacks started, at the latest, on 11 July 2014 and continued until the Ukrainian retreat from the area in early August. In July 2014, the US published satellite imagery documenting cross-border attacks on Ukrainian positions from inside Russia.[136] Subsequent analysis of the visible craters inside Ukraine documented that additional attacks originated inside Russia. The results from the crater analysis were supported in one case by a video recording of a MLRS launch north of Gukovo.[137] Since the publication of that analysis, it has been possible to identify a decidedly greater number of attacks from inside Russia from the same period.[138] In addition to cross-border attacks originating in Russia, this report further documented occurrences of cross-border traffic from Russia to Ukraine, the intention of which was to attack Ukrainian positions from inside Ukraine. Most of these attacks occurred in the first half of July and, therefore, accompanied the shelling of Ukrainian positions.[139] Both types of attacks – attacks after crossing the border and cross-border attacks from within Russia – are related to the Russian military build-up in the area along the border. In nearly all documented cases, identified launch sites were located close to Russian military camps.

Russian attacks destroyed the military equipment of the Ukrainian units and killed and injured numerous Ukrainian soldiers. Because the origin of the attacks were in Russia or very close to the border, there was no real possibility for the Ukrainian troops under assault to defend

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134   cf.: http://www.martenscentre.eu/publications/caught-act-proof-russian-military-intervention-ukraine and http://www.reuters.com/article/2014/06/12/us-ukraine-crisis-tanks-idUSKBN0EN1KS20140612 (last accessed on 31 July 2015)

135   cf.: http://www.armamentresearch.com/ares-research-report-no-3-raising-red-flags-an-examination-of-arms-munitions-in-the-ongoing-conflict-in-ukraine-2014/ (last accessed on 3 August 2015)

136   e.g.: https://twitter.com/GeoffPyatt/status/493390505003069440 (last accessed on 25 July 2015)

137   cf.: https://www.bellingcat.com/news/uk-and-europe/2015/02/17/origin-of-artillery-attacks/ (last accessed on 25 July 2015)

138   See http://mapinvestigation.blogspot.de/ (last accessed on 4 August 2015) for a more complete overview

139   It might be possible that the lack of impact caused by the first Russian attacks influenced the decision to launch future attacks from inside Russia. The necessity to cross the border to be able to attack from inside Ukraine was no longer a priority as of late July and August 2014.

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themselves and respond to the fire,[140] as any serious counter attack would have risked providing Russia with a *casus belli*, allowing greater open participation in the conflict. Complicating the situation further for the Ukrainian troops in the area was Russia's control over the supply route near Kuybyshevo. Because of this, it was difficult or even impossible for Ukraine to relieve the attacked units.

Had Ukraine regained control over the area near Kuybyshevo, the situation for Ukrainian troops would have been eased, which may have, in turn, affected the situation on the ground. But the fighting in the Kuybyshevo area was intense and included the use of tanks, artillery, and anti-aircraft systems. The Buk M1 documented in the area shows that Russia deployed heavy weaponry. The cross-border track north of Novaya Nadezhda, which was used at the end of July, further documents the direct delivery of materiel and personnel from Russia in this crucial period and area. The result is well known: Ukraine could not regain control over the area and the Ukrainian forces guarding the border in the Luhansk region were forced to retreat in early August. Hundreds of Ukrainian servicemen were compelled to cross the border into Russia because their situation was no longer bearable after weeks of constant shelling and attacks.[141]

After the complete loss of control over the border in the conflict zone of the Luhansk region, Ukraine attempted to regain control over the Kuybyshevo border area, launching a new offensive that sought to isolate Donetsk and Luhansk from the border area and Russia. Both offensives were partially successful in the beginning. During the middle of August, a series of major events occurred. A major DPR official and an LPR official commanding Russian troops inside Ukraine resigned. Ukraine regained control over the strategically important town of Novosvitlivka, severing the direct connection between Luhansk and Krasnodon.[142] Fierce fighting took place near Shakhtarsk and Snizhne in the Donetsk region, and on 14 August, the Kuybyshevo border crossing fell to Russian troops.[143]

It is possible to identify cross-border attacks on Ukrainian positions originating from Russia throughout this period. There is also evidence visible in satellite imagery indicating cross-border traffic in the conflict area. This is especially true for the Donetsk (Russia) area, which exhibits numerous new tracks crossing the border in the 8 August 2014 imagery that were not visible in the 15 May 2014 imagery or shows other signs indicating military usage. Furthermore, there is additional evidence demonstrating Russian participation. Russian soldiers crossed the border to fight inside Ukraine in the first half of August, as documented by photographs showing them in both, Russia and Ukraine as well as their reported deaths in the fighting near Snizhne on 13 August 2014.[144] Moreover, Western journalists saw and reported Russians troops caught in the act of crossing the Russian-Ukrainian border in the Donetsk (Russia) area.[145] Reuters journalists also found evidence of a weapons delivery from the Russian military to Russian forces in Ukraine.[146]

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140   Note: some areas close to the border (or even inside Russia) show signs indicating attacks occurred in this region. However, it is more likely that most of these attacks were directed at cross-border traffic than at Russian firing positions.
141   cf.: http://www.bbc.com/news/world-europe-28637569 and http://www.bbc.com/news/world-europe-28652096 (last accessed on 4 August 2015)
142   cf.: http://uk.reuters.com/article/2014/08/15/uk-ukraine-crisis-shelling-idUKKBN0GE0Y020140815 (last accessed on 4 August 2015)
143   cf.: https://www.youtube.com/watch?v=n8BhPloUqvI (last accessed on 31 July 2015)
144   cf.: http://www.atlanticcouncil.org/en/publications/reports/hiding-in-plain-sight-putin-s-war-in-ukraine-and-boris-nemtsov-s-putin-war (last accessed on 25 July 2015)
145   cf.: http://www.theguardian.com/world/2014/aug/14/russian-military-vehicles-enter-ukraine-aid-convoy-stops-short-border (last accessed on 27 July 2015)
146   cf.: http://www.reuters.com/article/2014/07/29/us-ukraine-crisis-arms-specialreport-idUSKBN0FY0UA20140729 (last accessed on 6 August 2015)

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Late August through Early September

The loss of the Kuybyshevo border crossing indicates that the situation had already worsened for the Ukrainian army by the middle of August 2014. However, the predominant turning point in this war was the period from late August to early September 2014. During this time, Ukraine lost multiple battles and, subsequently, control over larger parts of the Luhansk and Donetsk regions. In this last phase of the conflict in summer 2014, there were repeated claims of Russia's active participation. The US released satellite imagery showing a Russian military convoy moving westward near Krasnodon on 21 July 2014.[147] Ukrainian situation reports clearly stated that the Russian army participated in the fighting near Ilovais'k and east of Mariupol.[148] After this intense phase of fighting, which led to large Ukrainian losses, the conflict paused, or at least diminished, with the signing of first Minsk protocol in September 2014.

The satellite imagery presented above documents the increased number of cross-border tracks associated with the Russian army. Tellingly, new tracks crossing the border could be identified near all major hot spots in the border area during this phase of the conflict, encompassing the areas of Donetsk (Russia), Krasnodarovskiy, and Maksimov.

Donetsk (Russia) Area

The origin of this major Russian counterattack might have been in the Donetsk (Russia) area, which shows the earliest new traces of cross-border traffic in late August. Two major clashes in the Luhansk region may be related to the border crossings in the Donetsk (Russia) area, namely, the battles for Luhansk and the Luhansk airport. The border north of Donetsk (Russia) is formed by the Siverskyi Donets River. Therefore, if Russia participated in the fighting near Luhansk, the forces must have crossed the border near or south of Donetsk (Russia).

While it is possible to find direct evidence in the border areas, such as tracks crossing the border, it is much more difficult to establish a relationship between the fighting 35 kilometers from the border inside Ukraine and the border crossings. That said, Google Earth imagery from 27 and 31 August provides evidence that such a relationship does exist. The location of former camps close to roads leading from Donetsk (Russia) to the area west of Krasnodon and east of Luhansk are one such indication.

One likely track leads from Bilen'ke and Severnyi, an area north of Donetsk (Russia) with border crossings, to the north. Traces indicating a former camp are visible near Velykyi Sukhodil on 27 August 2014.[149] Similar traces are not visible on 8 August 2014 in the same area. Following the road farther north leads to an area with former camps near Panteliivka.[150] Again, the traces indicating the camps are not visible in the 8 August imagery. The camps near Panteliivka are located east of Novosvitlivka, the strategically important locality south of Luhansk, which was controlled by Ukraine late last August. West of Panteliivka are traces of outgoing fire heading in the direction of Novosvitlivka.[151] From the Panteliivka area, it is

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147   The area presented is north of Suchodilsk (48.366896, 39.707526), cf.:
        http://usnato.tumblr.com/post/96003086125/new-satellite-imagery-exposes-russian-combat (last accessed on
        4 August 2015)
148   cf.: http://www.rnbo.gov.ua/en/news/1792.html (last accessed on 31 July 2015)
149   Not presented; see 48.448179, 39.870850. The tracks are more pronounced in the satellite imagery taken on 31 August
        2014.
150   Not presented; see 48.496109, 39.724656
151   Not presented; see 48.487809, 39.661411

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possible to identify additional former camps on the road to Novosvitlivka, but there are also traces indicating a track leading from there to the north to Mykolaivka, a locality east of Luhansk. Some traces of camps are visible in this area on 31 August that were not visible in early August.[152] This area was not under Ukrainian control by 22 August 2014, because the first Russian "aid" convoy entered Luhansk using a dirt road in the Mykolaivka area on that date.[153]

Ukraine retreated from and lost control over Novosvitlivka at the end of August 2014.[154] In the satellite imagery from 31 August 2014, multiple groups of vehicles can be seen in the area. For instance, a group of vehicles can be seen traveling from the Panteliivka area in the direction of Novosvitlivka,[155] and a second group, including towed artillery, can be seen moving westward near Mykolaivka.[156] Near Vyshnevyi Di, another group of vehicles was parked with a western orientation.[157]

The existence of a track winding from the border area to the area west of Krasnodon was implied by the satellite imagery published by the US, which showed two groups of vehicles, one heading west and the other north in an area north of Suchodilsk.[158] Following the road leads to two possible origins. To the east, the path leads to former camps east of Suchodilsk[159] and then to Bilen'ke and Severnyi. Following the path southward leads to the northern entry of Krasnodon. Traces of a new camp can be seen in the northern part of Krasnodon that did not exist on 8 August 2014.[160] Krasnodon is well connected with the border crossings in the Donetsk (Russia) area via paved roads.

Some traces of outgoing fire toward the Luhansk airport can be found north of Suchodilsk, close to the area presented in the US imagery.[161] Many more traces of outgoing fire are discernible in a field northwest of Suchodilsk, east of Prydorozhnje.[162] Most of these positions were, however, already abandoned by 31 August 2014. Further traces of outgoing fire and new positions still being used at the time, can be found west of this area.[163] This indicates that the attack on the Luhansk airport was carried out from east to west. On 31 August 2014, the day of the satellite imagery was taken, the Luhansk airport fell to Russian troops.

The vehicles visibly participating in the attack on the Luhansk airport indicate Russia's participation. A Msta-S battery is visible in a position south of the Luhansk airport.[164] While the Msta-S is also used by Ukraine in limited quantities, it is highly unlikely that the visible Msta-Ss were captured. The capture of a full battery of working Msta-Ss – the most modern self-propelled artillery in the Ukrainian military – would not have gone unnoticed. In addition

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152   Not presented; see 48.577984, 39.556121
153   cf.: https://twitter.com/JulianRoepcke/status/502781578159063040 (last accessed on 5 August 2015)
154   cf.: http://bigstory.ap.org/article/pro-russia-rebels-confident-after-making-gains (last accessed on 5 August 2015)
155   Not presented; see 48.503973, 39.613524
156   Not presented; see 48.581332, 39.538282
157   Not presented; see 48.539010, 39.487455
158   cf.: http://usnato.tumblr.com/post/96003086125/new-satellite-imagery-exposes-russian-combat (last accessed on 4 August 2015)
159   Not presented; see 48.359981, 39.764781
160   Not presented; see 48.317314, 39.706616
161   Not presented; see 48.372040, 39.729215
162   Not presented; see 48.401645, 39.627552
163   An analysis presenting the visible positions near the Luhansk airport from the 31 August 2014 Google Earth satellite imagery can be found at http://ukraineatwar.blogspot.de/2015/01/google-earth-shows-attack-of-russian.html (last accessed on 5 August 2015)
164   Not presented; see 48.324056, 39.356916. The Msta-S can be easily identified in the satellite imagery because of the distinct barrel length. Other Russian self-propelled artillery have comparably shorter barrels.

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to the type of equipment used, the sheer number of vehicles can be seen as additional evidence of Russia's direct participation.[165] In total, more than 100 military vehicles can be seen in the area south of Luhansk on 31 August 2014. At the same time, there was fierce fighting in all parts of the conflict zone, especially near Ilovais'k and east of Mariupol. The major military buildup in the area is also indicated by a video released on 2 September, which shows a military convoy of more than 100 vehicles moving eastward just north Krasnodon.[166]
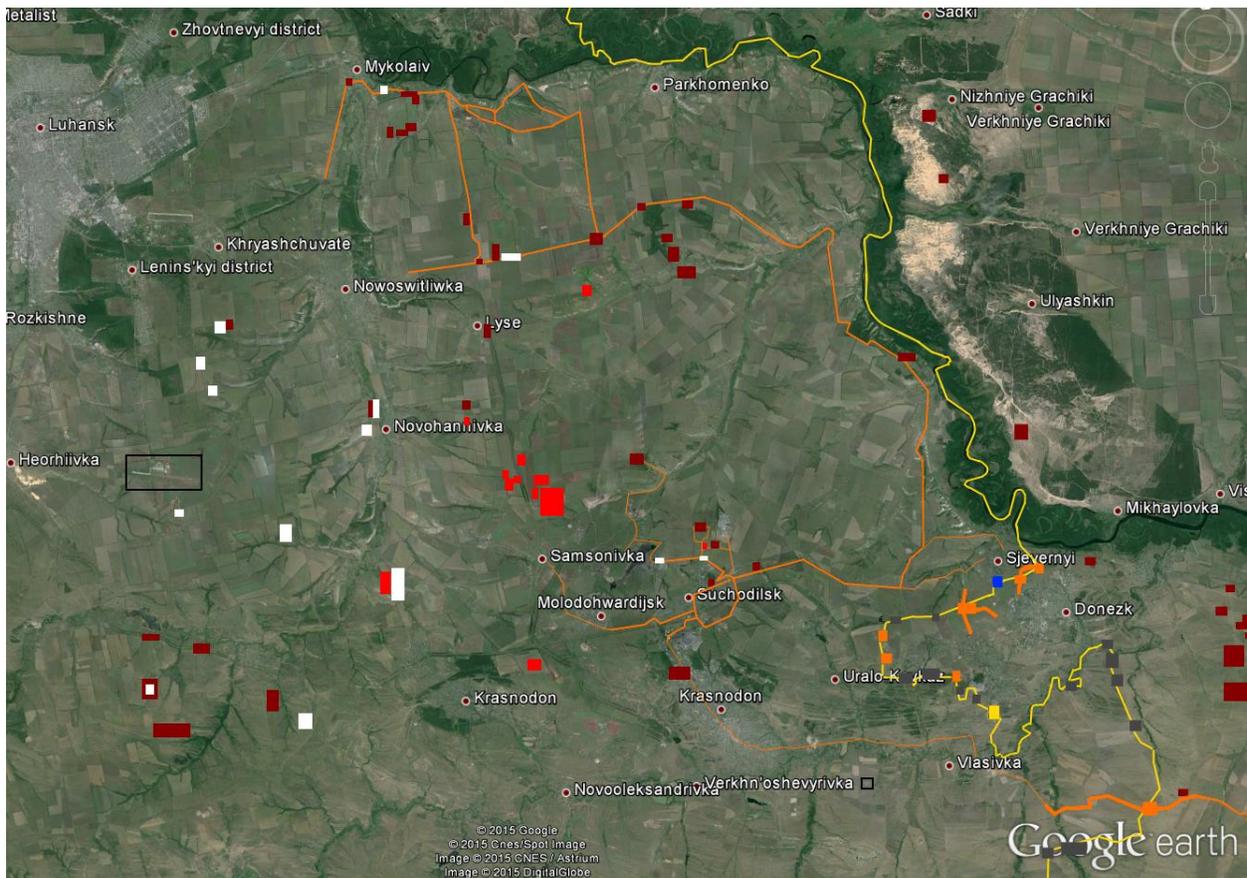

Figure 49: Overview of the conflict zone south of Luhansk at the end of August 2014 along the border area: orange: discussed border crossings; thick orange paths: identified routes connected with the border crossings; gray: other unofficial border crossings not discussed in this report; yellow: the Donetsk (Russia) border crossing observed by the OSCE; blue: official border crossing not observed by the OSCE; dark red: temporary Russian military camps; Overview of the conflict zone inside Ukraine: dark red: areas of (likely) Russian military or former military camps; black: former Ukrainian camps in the area and the Luhansk airport; red: area with signs of outgoing fire; white: visible vehicles; orange line: the estimated tracks from the border connecting the camps (the estimated certainty is indicated by the thickness of the line); sources: Google Earth and the author's data; this representation is not necessarily exhaustive

Figure 49 presents the summary for the discussed area south of Luhansk. The visual evidence indicates that the attacks on the Ukrainian positions originated from areas east and northeast of Novosvitlivka and from the Krasnodon area. In the course of the fighting, the attacking forces moved westward, as suggested by the location of the former positions and the actual positions on 31 August 2014. The visible traces indicate that there was a large army in the area. Either the Russian troops inside Ukraine retreated to this area before regrouping for

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165   Aside from the aforementioned Msta-S, it is also possible that Russia's most modern tank, the T-90, was used in this area. For more details, see http://sled-vzayt.livejournal.com/3367.html (last accessed on 9 September 2015)

166   Given the amount of self-propelled artillery visible in the satellite imagery and in the convoy, the column cannot represent all units seen in the satellite imagery. For a description of the convoy and a geolocation of the position, see: http://ukraineatwar.blogspot.ru/2014/09/russian-moves-huge-convoy-of-armor-into.html (last accessed on 5 August 2015)

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their counterattack, or these troops came from Russia. The latter is indicated by the visible border crossings in the Donetsk (Russia) area and the estimated paths connecting these border crossings and the military positions. Either way, satellite imagery clearly documents that the army coming from the east clearly decided the outcome of the fighting in this area.

Krasnodarovskiy Area and the Maksimov Area

Also at the end of August, there was fierce fighting in two other areas close to the border, one of which was the Krasnodarovskiy area, located south of Ilovais'k. The attack on the Ukrainian army fighting in this area was accompanied by cross-border artillery and MLRS attacks. Satellite imagery documents a new track crossing the border in late August. It is also possible to document with the satellite imagery that the Russian army using this track formed at least the southern part of the encirclement of the Ukrainian troops fighting in Ilovais'k. The appearance of these soldiers led to a complete collapse of the Ukrainian defense in the border area and completely blocked the retreat path of the Ukrainian army, which was then trapped in Ilovais'k. As the situation became unbearable, the Ukrainian army attempted to retreat from the city. The retreating army was attacked, resulting in massive casualties and the destruction of a considerable amount of military hardware.[167]

It is possible to positively identify the attacking force as being part of the Russian army. Satellite imagery shows that the path used to attack Ukrainian positions begins in Russia and, indeed, military vehicles can be seen heading eastward on the path toward the Ukrainian-Russian border in September. Other vehicles visible on the same day provide evidence for the major military buildup in this area. However, satellite imagery is only one part of the available evidence. Journalists on the ground saw similarly marked servicemen and vehicles on both sides on the border in August. The 10 Russian soldiers who were captured in the area in August wore the same identification markings as the soldiers seen by the journalists. Vehicles marked with a white circle also document that military equipment unique to Russia was used in battle. But the most striking evidence is provided by Russian servicemen themselves. There is at least one image showing Russian servicemen inside Ukraine posing in front of a town sign.[168] Other images uploaded after the events show Russian servicemen inside Russia, posing in front of bases close to the border crossing and documenting that these were in fact Russian army installments. Others posed in front of their vehicles, which were still marked with a white circle.

The area east of Mariupol is a second area with fighting close to the border. A completely new front was created in this area at the end of August. Again, Russian ground troops appeared after Ukrainian defensive positions had been shelled, and Ukraine quickly lost control over large parts of the border area in the region. This new front not only led to territorial losses, it also forced Ukraine to reinforce the defense of Mariupol, reducing the resources available for other areas with intense fighting. In September, Ukraine retreated from the entire Ukrainian-Russian border in the Donetsk region and created a new line of defense roughly 30 kilometers inside Ukraine.

The ground forces attacking in this area can be also linked to the Russian army. Multiple cross-border tracks are apparent in the area, the majority of which are near the Russian village

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167   cf.: http://www.kyivpost.com/content/ukraine/up-to-459-ukrainian-soldiers-killed-near-ilovaisk-in-2014-ukraines-chief-military-prosecutor-386451.html and http://www.interpretermag.com/ukraine-live-day-534-heavy-fighting-around-donetsk-continues-this-morning/#9386 (last accessed on 5 August 2015)
168   cf.: https://en.informnapalm.org/they-shot-ukrainians-near-ilovaisk/ (last accessed on 5 August 2015). Note that the linked profiles of the soldiers no longer exist.

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of Maksimov, north of the Novoazovsk – Veselo-Voznesenka border crossing. Along with the documentation of Russian soldiers in the area, the military equipment seen indicates active participation on the part of the Russian army. Journalists, for instance, filmed Msta-S self-propelled artillery east of Mariupol. One Msta-S in particular was seen beforehand in Russia in Rostov-on-Don. The same convoy was also accompanied by a fuel truck, which was marked with a white circle as seen on Russian military equipment south of Ilovais'k.[169]

169   cf.: https://www.bellingcat.com/resources/case-studies/2015/05/29/confirming-the-location-of-the-same-msta-s-in-russia-and-ukraine/ (last accessed on: 25 July 2015) and https://informnapalm.org/11391-sau-msta-s-novoazovskom (last accessed on: 9 September 2015)

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Summary for the Conflict Zone

This section argued that all major Ukrainian losses in the border area in summer 2014 were related to the Russian army. It was the Russian army whose actions caused the Ukrainians to lose control of the border area in the Luhansk region. It was the Russian army that attacked Ukrainian troops, delivered reinforcements, and, in doing so, actively hindered and effectively stopped Ukraine's offensive in early August. Moreover, it was the Russian army itself that altered the course of the war by defeating the Ukrainian army in major battles at the end of August through early September 2014.

The summary of all border crossings and paths connected with these border crossings in the conflict zone is presented in figure 50. It is a collection of identified areas, major border crossings, and other evidence depicting the immense volume of cross-border traffic in the conflict zone. It can also be seen as a visualization of Russia's active role in the war in eastern Ukraine as well as a map of Russia's literal paths to war.
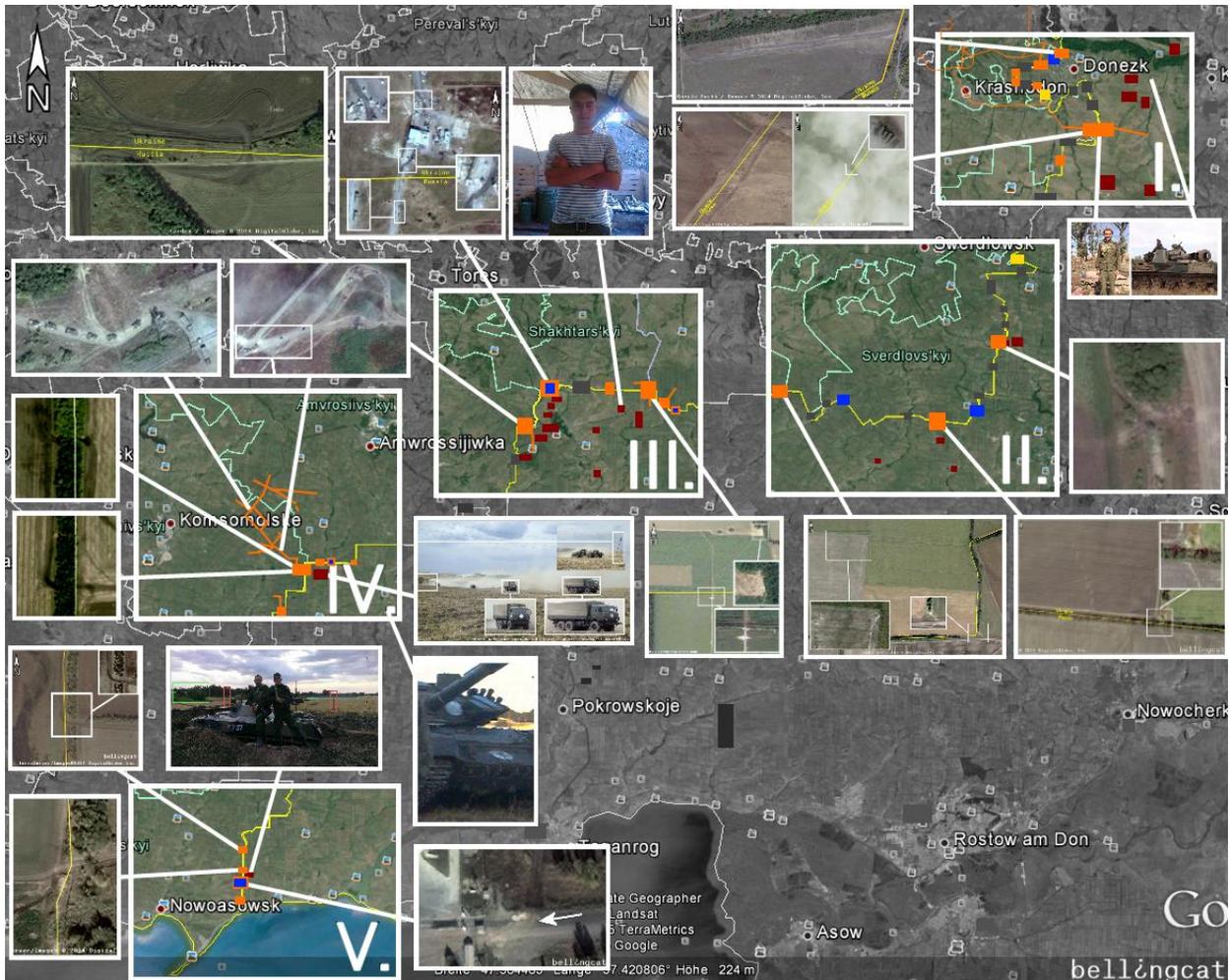

Figure 50: Overview of the conflict zone: orange: discussed border crossings and connected paths; gray: other unofficial border crossings not discussed in this report; yellow: OSCE-observed Donetsk (Russia) and Gukovo border crossings; blue: other official border crossings not observed by the OSCE; dark red: temporary Russian military camps; sources: Google Earth, Yandex, preview imagery from TerraServer, Reuters, VK, author's data

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Discussion

The objective of this report was to assess the border area in the conflict zone in Eastern Ukraine and to identify border crossings that could be associated with the Russian army. This topic is closely related to the definition of the conflict in Ukraine. If there has been major participation on the part of the Russian army, the war can no longer be seen as an internal conflict. However, Russia continues to maintain that an internal, civil war is being fought, and that no active Russian servicemen have been ordered into combat in Eastern Ukraine. Moreover, Russia states that it has had no active role in the conflict. Previous research has already documented that this claim is not true. Cross-border attacks on Ukrainian positions have been documented as have the deaths of active Russian servicemen in Ukraine. Other Russian servicemen documented their participation in the war in their own social media accounts or through interviews with journalists. There is also evidence that military equipment unique to Russia and Russian-delivered equipment was and is still being used in the war. However, while all of this evidence demonstrates that Russia is playing an active role in the conflict, the degree to which it is doing so cannot be determined relying on this information alone.

This report's assessment of the border area in the conflict zone using satellite imagery establishes that there is a large number of tracks crossing the border in the conflict zone. Because there are also tracks crossing the border already visible in 2013, a track in and of itself does not necessarily prove that a border crossing took place by the Russian military. However, some border crossings are of a scale not seen in the area before and/or are closely related to the Russian army. Two different types of border crossings were identified: tracks crossing the border so as to launch attacks from inside Ukraine and tracks crossing the border to enter Ukraine and reach an – in most cases – unknown target inside Ukraine. Instances of the former were primarily identified for July 2014. The first track of the latter type for which a date could be estimated was created toward the end of July 2014. However, there are numerous other tracks (e.g., in the Donetsk [Russia] area) that may have been used before August 2014. In August, especially near the end of the month, new tracks could be identified. It was even possible to discover tracks used sometime during middle or end of September 2014. In most cases, the direction of the traffic on the tracks could not be determined indisputably. Even so, the timeframe in which a border crossing appeared strongly indicates the direction. However, for the purposes of this report, the direction of cross-border traffic is mostly irrelevant. If a border crossing is related to the Russian army, even Russian troops leaving Ukraine via this border crossing documents their participation in the war.

The most notable findings of this report are the sheer amount of border crossings and the close relationship, both in place and time, between all major border crossings and major battles in the border area of Eastern Ukraine. It also strengthens already assumed links between the border crossings and Russia's armed forces. Furthermore, the report presents new visual evidence documenting the border crossings and verifies released imagery using free and open sources. Two novel and important findings are included in this report. First, in the Donetsk (Russia) area, satellite imagery shows vehicles stationed on the Ukrainian-Russian border. This border crossing is closely linked to the Russian army with a high degree of probability. Second, in the Krasnodarovskiy area, additional columns of military vehicles were identified, indicating a substantial military buildup in the area. The imagery depicting a column heading to the border was verified.

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Together, with evidence presented elsewhere, this report arrives at the following conclusion: It is well documented that *a* Russian army (perhaps not that of the Russian Armed Forces proper) participated in the hostilities inside Ukraine in July and early August.[170] However, it seems dubious to artificially separate the Russian army inside Ukraine and Russia's Armed Forces. Even if most of the fighters are not active Russian servicemen or bona fide "civilian contractors" for the Russian Armed Forces, they should nonetheless be regarded as the latter. The close connection between the two forces is demonstrated by Russia's supply of military hardware and the Russian cross-border attacks in this phase of the conflict. The cross-border attacks also prove that Russia's Armed Forces participated in the hostilities during this period. In the later phase of the fighting in summer 2014, it has been proven that Russia's Armed Forces participated in the fighting inside Ukraine and decisively changed the course of the war.

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170 In this case, the term "Russian army" does not necessarily represent all armed forces in Eastern Ukraine fighting against Ukraine.

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- Google Earth
- Yandex
- Bing

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- VK
- @DajeyPetros (Ukraine@war blog)
- @JulianRoepcke (Bild)
- @Liveuamap
- @Interpreter_Mag (The Interpreter)
- @en_informnapalm
- @Askai707

Press:

- Reuters
- Associated Press
- Vice News
- Novaya Gazeta

And, of course, a special thanks to all the sources we forgot to mention here.

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Appendix

Figure A1: Dirt road east of Mykyshivka (48.248721 39.970812): comparison of 8 August 2014, 21 August 2014, and 26 August 2014 (first row) and 27 August 2014, 31 August 2014, and 11 September 2014 (second row); contrast and tone adjusted; sources: preview imagery from TerraServer (21 August and 11 September), Google Earth (all other dates)

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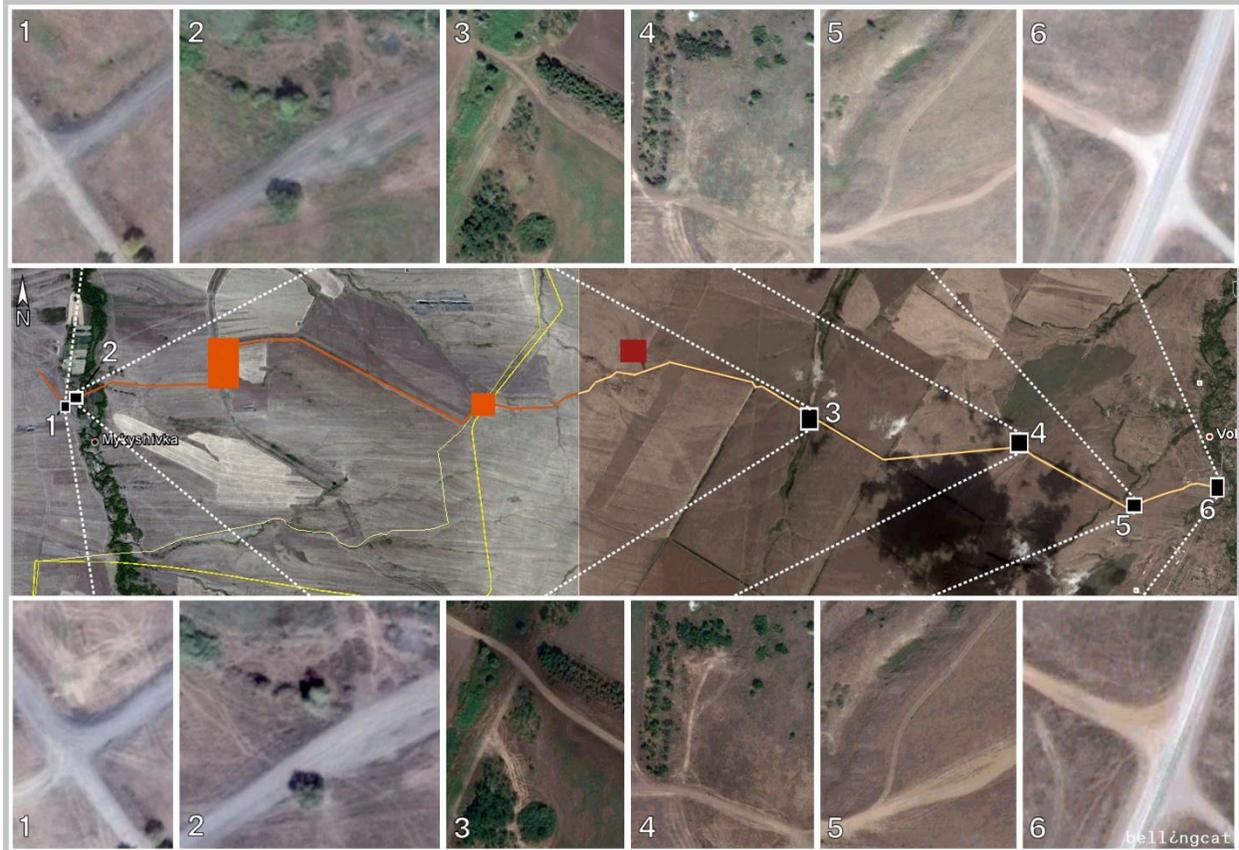
Figure A2: Dirt road connecting Mykyshivka and Volchenskiy: comparison of prominent features (marked black) on the path between the two villages; the second row presents the overview, while the first and third row show the detail of the prominent features; the first row uses 8 August imagery; the third row uses imagery from 26 August (bright area) or 22 August (darker area); the areas are numbered to ease the identification; the orange path marks the road, the orange-marked area and the red-marked Russian military camp are presented separately; source: Google Earth

Figure A3: Frame from the Sverdlovsk video (2:47) and the area in Google Earth (48.070120 39.650249); some prominent features visible in the video and the Google Earth imagery are marked; sources: YouTube and Google Earth

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Figure A4: Temporary Russian military camp south of Novaya Nadezhda (47.829512, 39.047793 and 47.818853, 39.049212): comparison between 8 August (left) and 15 August 2014 (right); an area with vehicles is enlarged; contrast and tone adjusted; note, only part of the enlarged area is visible in the larger view; source: preview imagery from TerraServer

Figure A5: Slavik Sitnikov and geolocation of his uploaded image: the image was uploaded on his VK account on 17 September 2014 (https://archive.is/MF0Z8); the middle image presents the same area in Google Earth on 14 September 2014; the right image presents the geotag of this image (reuploaded version 29 July 2014, https://archive.is/Fuc0H); note, he rearranged the imagery on his account and removed some of the older images only to reupload them later; sources: VK, archive.is, Google Earth

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Figure A6: Position of temporary Russian military camps (47.545143, 38.502212): left: geotag of an image (https://archive.is/otCPf) showing Russian soldiers in front of tanks marked with white circles uploaded on 29 September 2014; middle and right: comparison between 15 August 2014 and 9 October 2014; contrast and tone adjusted; sources: VK (left), preview imagery from TerraServer (middle and right)

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